American Journal of

PUBLIC HEALTH

and The Nation's Health

The 83rd Annual Meeting
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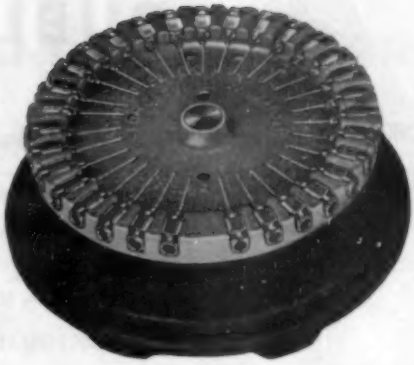

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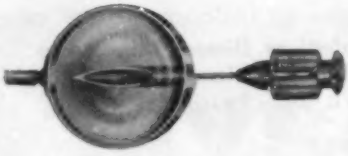

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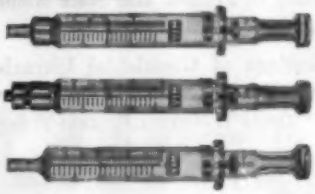

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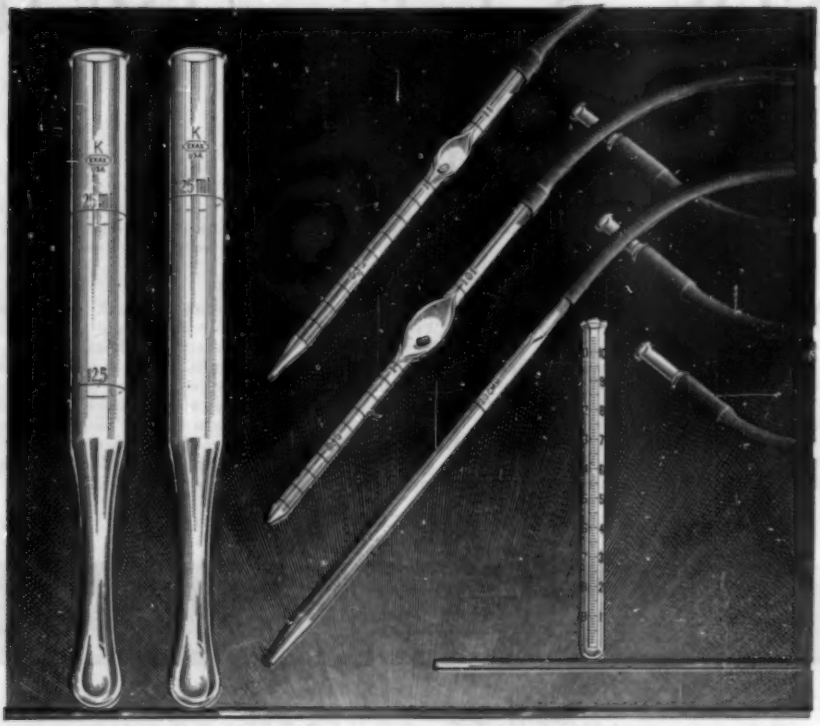

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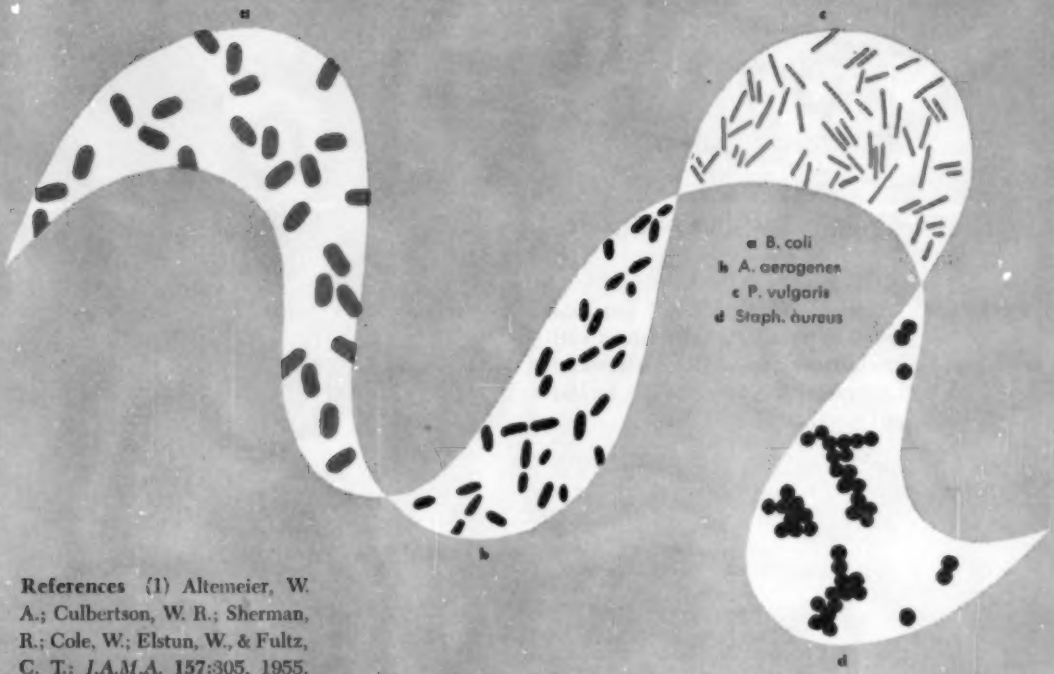

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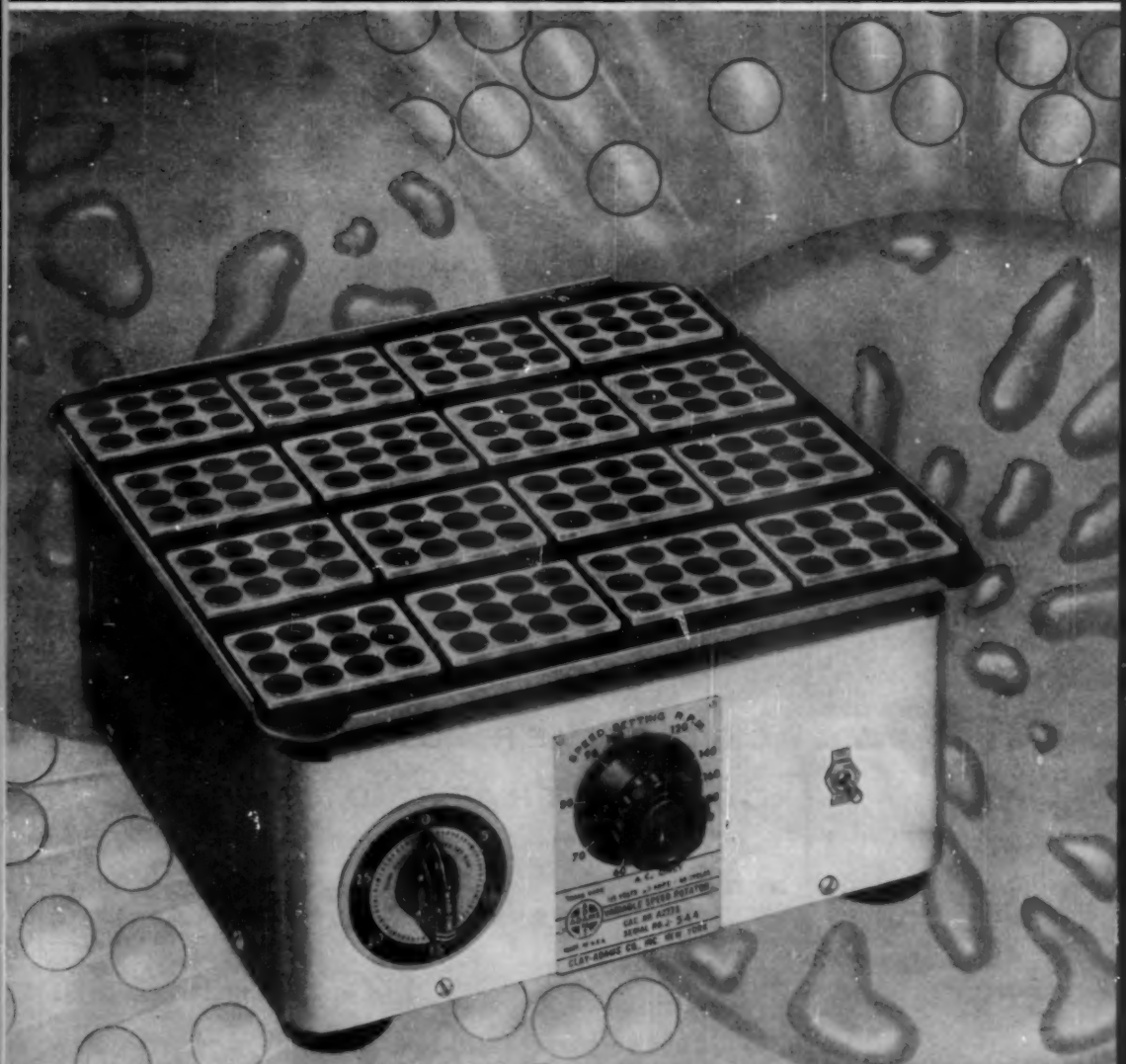

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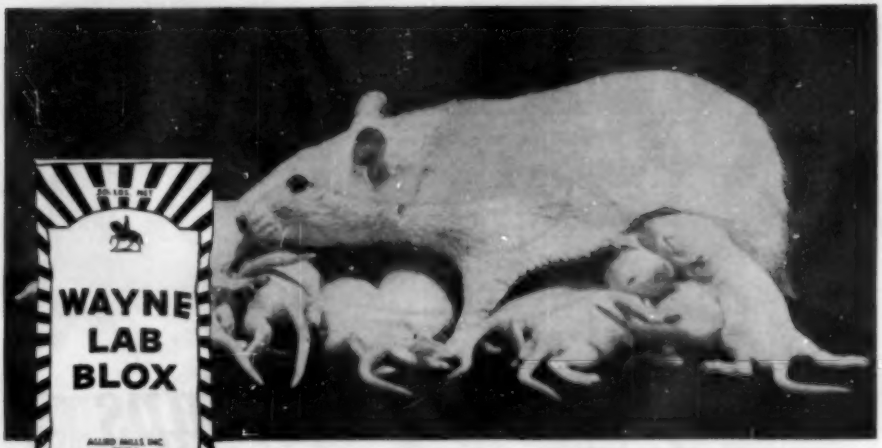

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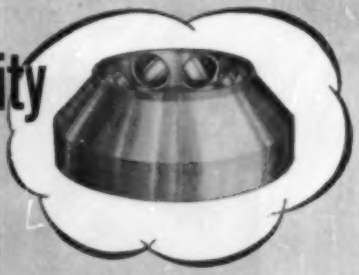

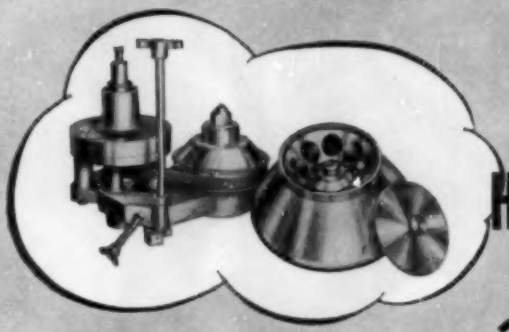

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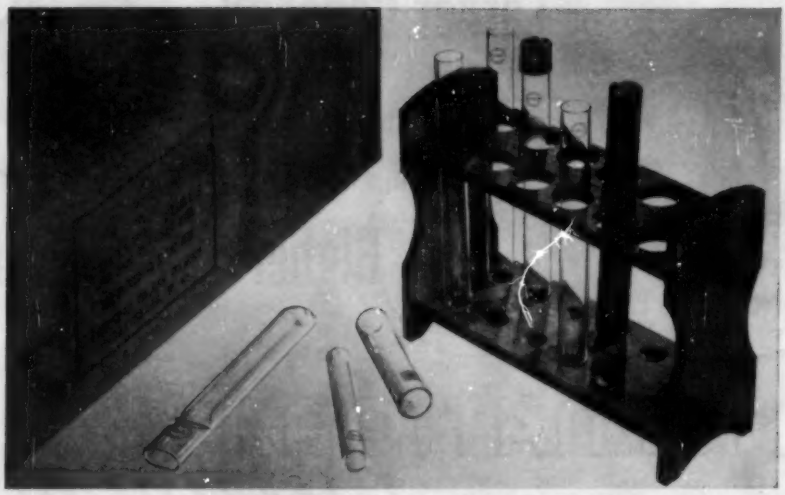

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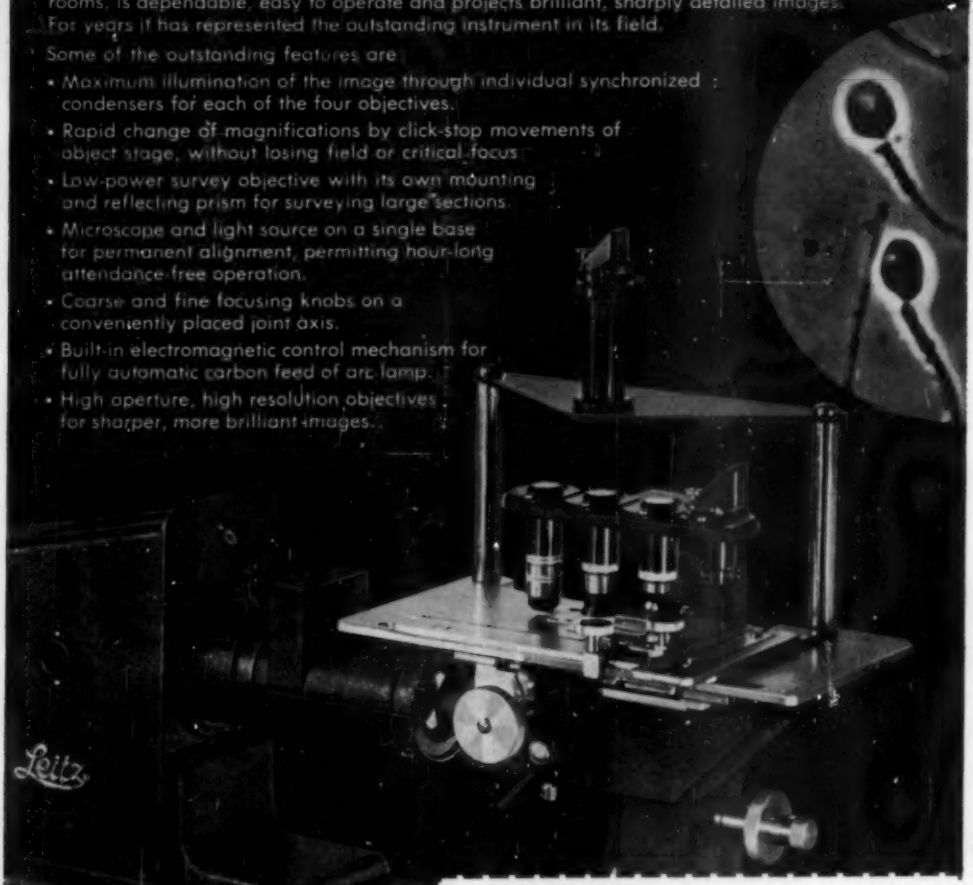

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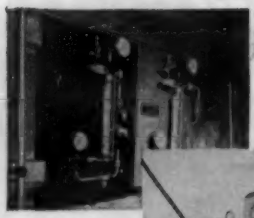

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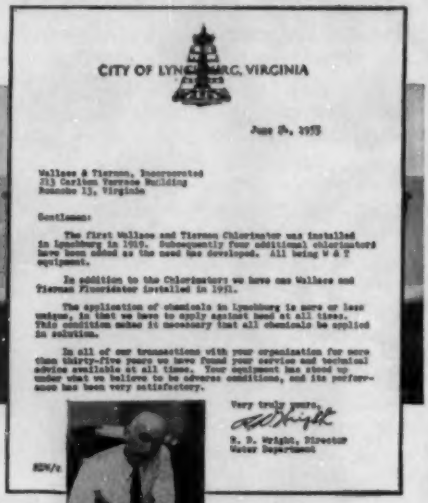

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Effect of Booster Inoculations on the Serologic Status of Children Vaccinated with Poliomyelitis Vaccine

GORDON C. BROWN, Sc.D.

This short paper represents some very recent work on a subject of great current interest. It was at the suggestion of Dr. Thomas Francis that the author followed up some of the children who were vaccinated in the 1954 field trial and who then received the booster inoculation this spring, one year later.

During the 1954 field trial of the efficacy of poliomyelitis vaccination children in 10 counties of Michigan were inoculated on the dosage schedule recommended at the time, namely, 1.0 ml intramuscularly at zero, one, and five weeks. A representative fraction of these individuals were bled before and after vaccination, and the results of neutralization tests with the sera were incorporated in the Summary Report of the evaluation of the field trial.[1] Although Salk has described the effect of a booster dose of vaccine 10 months following primary stimulation,[2] it seemed advisable to obtain additional information of this effect, especially under actual field conditions. Furthermore, since there was considerable variation in the antigenicity of different lots of vaccine originally used in some of the counties such a study would provide information concerning the degree of response to the booster inoculation in children receiving a good or a poor primary stimulus.

Plan of Study

Although the supply of vaccine was sharply limited during the spring of 1955, most of the children who had

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This study was aided by a grant from the National Foundation for Infantile Paralysis.

been vaccinated in Michigan during 1954 received a booster inoculation in May. Information was obtained from the Vaccine Evaluation Center as to which children had actually received the vaccine, not placebo, and through the cooperation of the health departments in three of the counties * 119 previously vaccinated children were bled before receiving the booster and again two weeks later. In Kent County a vaccine rated as "good" in the Summary Report had been used for the primary stimulus; in two counties, Lenawee and St. Clair, a vaccine rated as "poor" had been used. Eighty-three paired sera were obtained from Kent County and a total of 36 paired sera from the other two counties. The booster inoculation in all three counties was performed with vaccine from one manufacturer (although not the same as in 1954), but a different lot was used in Kent County from that used in Lenawee and St. Clair Counties. The sera were separated and stored at 4° C until tested.

Results

The sera were tested for antibodies against the three prototype viruses by the same technic used in this laboratory during its participation in the 1954 field trial.[3] This consisted of adding 0.25 ml of the desired serum dilutions (1/4, 1/8, 1/16, 1/64, 1/256, and 1/1,024) to tubes containing cultures of HeLa cells in 0.25 ml of tissue culture fluid.[4] After the serum dilutions had bathed the cells for approximately one hour, 0.25 ml of the three standard viruses representing 100 tissue culture doses was added to the appropriate tubes. Virus titrations and homologous serum controls were incorporated in each test. The tubes were incubated at 37° C and read usually on the third or fourth day at which time microscopic examination revealed cytopathogenic evidence of virus activity if present. Such cytopathogenicity was interpreted as evidence that the serum dilution had not neutralized the 100 TCD of virus. The highest serum dilution preventing any such change was taken as the antibody titer.

This test compared more nearly to a protection test than to the routine neutralization test usually performed in tissue cultures where the virus-serum mixtures are incubated together before their addition to the susceptible cells. Comparative tests with different technics, both in this laboratory and by exchanging sera with other laboratories, show that this technic resulted in lower titers of antibody and is in effect a more severe test for a given serum.[5] Repeated tests with standard sera and viruses since 1954 have indicated a further decrease in the sensitivity of this method. The antibody titers of these children before and after primary vaccination, however, had been determined by this technic and reported to the Vaccine Evaluation Center in 1954. Since some specimens had been exhausted and because of the time involved in retesting, they were not repeated at the same time with the pre- and post-booster sera from 1955 even though such simultaneous testing would have been more desirable. Therefore, in order to make the two sets of results as comparable as possible, the 1955 sera were tested by the same technic rather than by a more sensitive one.

Figures 1 and 2 represent the serum antibody changes of individual children of the three counties following primary vaccination and after the booster inoculation one year later. It will be seen that those in Kent County

* We are indebted to Dr. John Morley, Kent County, Dr. C. C. Benjamin, St. Clair County, and Pearl Haist, Lenawee County, for their assistance and cooperation in obtaining blood specimens.

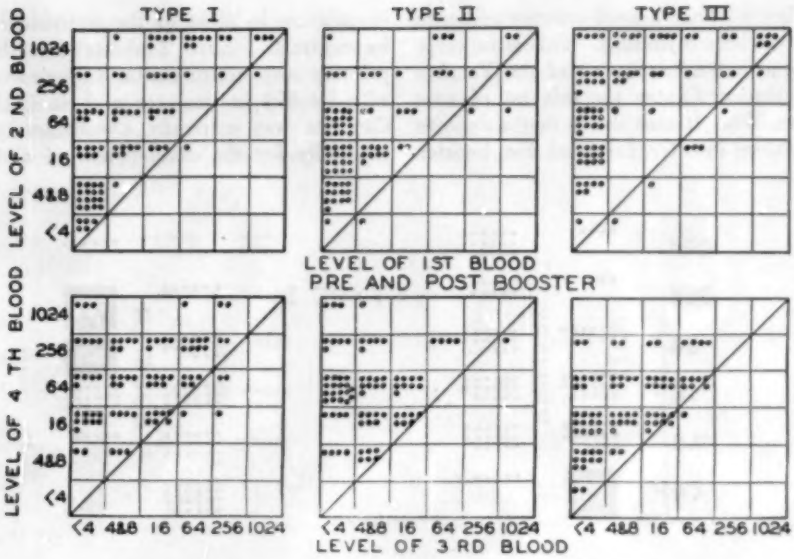

Figure 1—Serum Antibody Changes, Kent County, 83 Subjects Pre- and Postvaccination

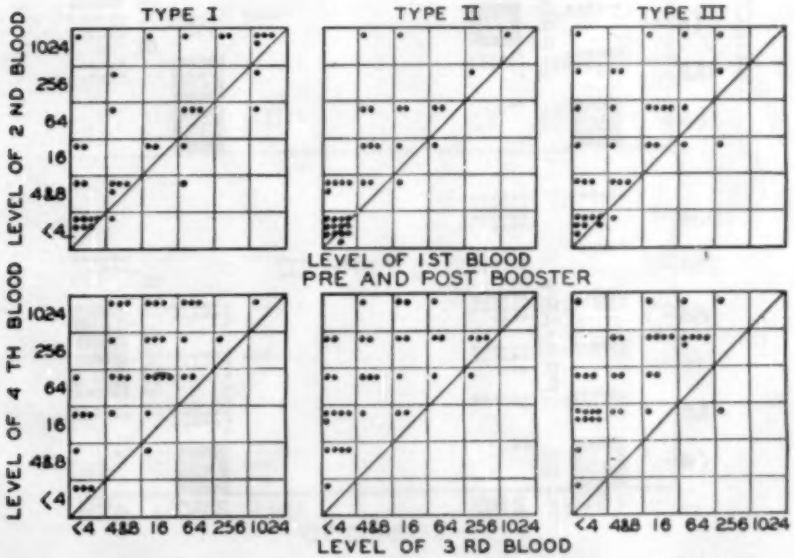

Figure 2—Serum Antibody Changes, Lenawee and St. Clair Counties, 36 Subjects Pre- and Postvaccination

(Figure 1) had a good primary response to the three injections. This is in keeping with the conclusion of the Vaccine Evaluation Center for this lot of vaccine, 304. It also shows that a definite increase in titer followed the booster inoculation in most of the individuals. In contrast, Figure 2 shows that the primary response of children vaccinated with lot 503 in Lenawee and St. Clair Counties was generally unsatisfactory, especially for the development of anti-

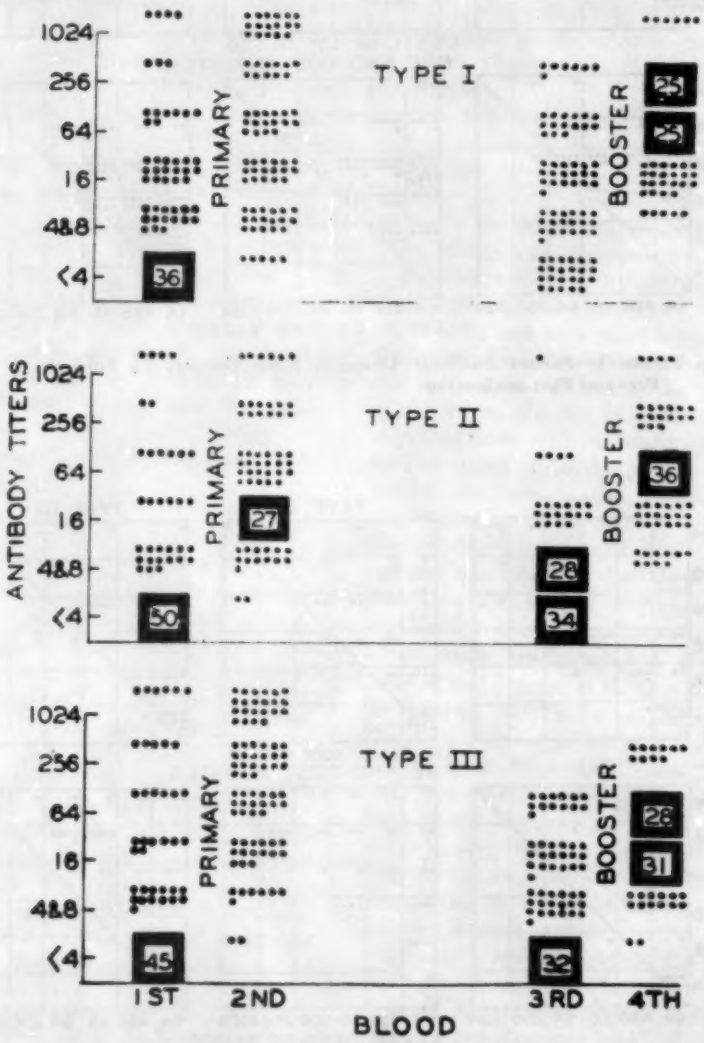

Figure 3—Serum Antibody Titers Before and After Primary Vaccination and Before and After Booster, One Year Later, Kent County, 83 Subjects

bodies to Types I and II virus. This is obvious from the figure even though the numbers are smaller. However, the response to the booster appears to be quite good.

These same results are presented in somewhat different fashion in Figures 3 and 4 which indicate the serologic status of the children before and after primary vaccination and a year later, before and after the booster, and show in summary fashion the exact antibody

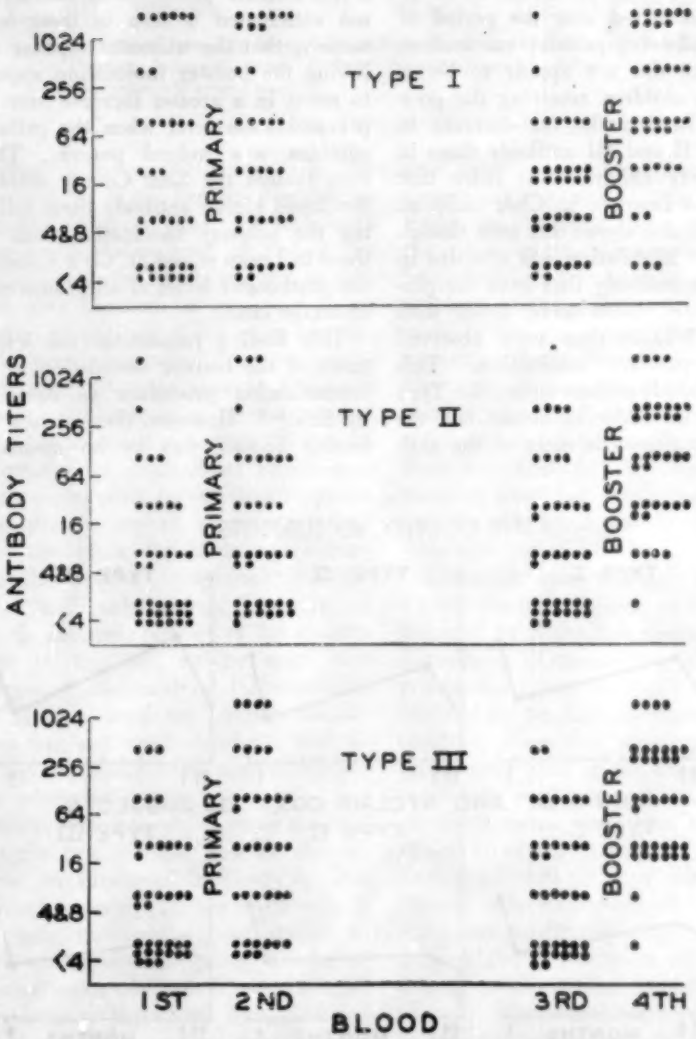

Figure 4—Serum Antibody Titers, Before and After Primary Vaccination and Before and After Booster One Year Later, Lenawee and St. Clair Counties, 36 Subjects

levels of the groups at each of the four bleedings. These figures tend to emphasize the differences in primary response following good and poor primary vaccination (Kent vs. Lenawee and St. Clair Counties), but in addition demonstrate that in the Kent County children a decline in serum antibody titer had occurred over the period of the year following primary vaccination. The decline did not appear to be as marked in children receiving the poor vaccine. In fact the fold-decrease in the Types II and III antibody titers in Kent County children was twice that observed in Lenawee-St. Clair children.

Figure 3 also shows that even though the booster inoculation was effective in raising the antibody titer over the prebooster level, there were fewer with titers of 1/1,024 than were observed following primary vaccination. This was particularly evident among the Type III data. In order to consolidate the results, the geometric mean of the antibody titers was determined for the various groups and is presented in Figure 5, which shows the tendency of the serum antibody titers to return to their prevaccination levels after one year regardless of whether the primary stimulus was good or poor. Furthermore, another phenomenon which was not anticipated is seen in these tests, namely, that the ultimate response following the booster inoculation appears to result in a greater increase over the prevaccination level when the primary stimulus was judged poorer. Thus, even though the Kent County children developed higher antibody titers following the primary vaccination than did those in Lenawee and St. Clair Counties, the postbooster levels of all groups were about the same.

This finding emphasizes the importance of the booster inoculation in the immunization procedure as described by Salk.[2, 6] However, the response following booster was by no means as

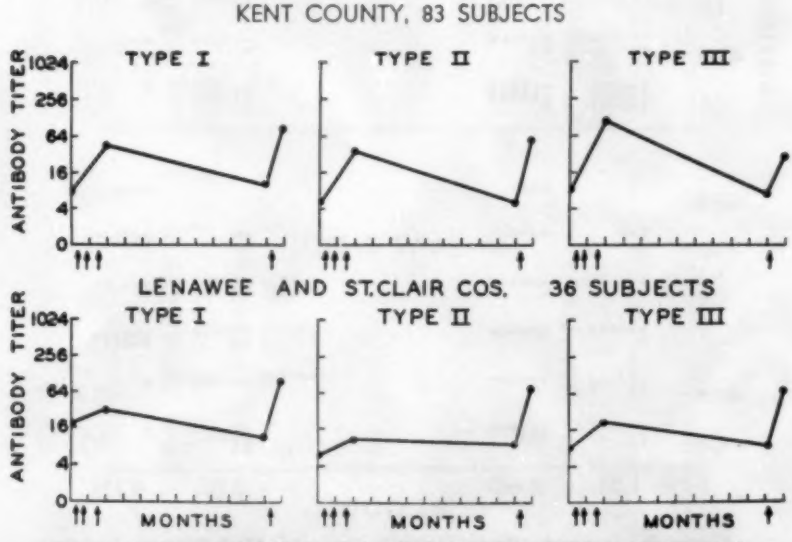

Figure 5—Geometric Mean of Antibody Level in Children Before and After Primary Vaccination and Before and After Booster One Year Later.

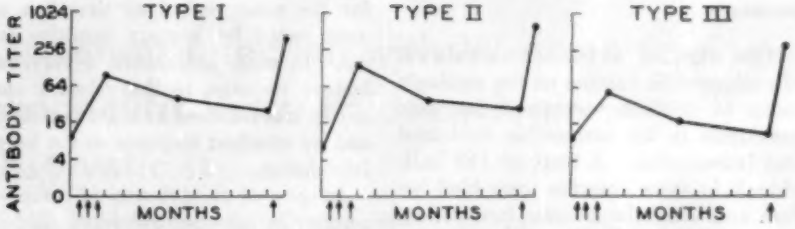

Figure 6—Geometric Mean of Antibody Level in Children Bled 5 Times During Interval from Before Vaccination to After Booster, 18 Subjects—Wayne County

marked in the present study as in that reported by him. Several possibilities for this difference exist. As mentioned previously, the technic of testing for antibodies in this study was not as delicate and resulted in generally lower titers. In addition, the booster inoculations were given after one year rather than after 10 months as in his latest report,[2] although in a previous study[6] Salk administered a booster 20 months following two small doses of monovalent vaccine with an excellent response. The present report represents actual field conditions for both the primary and the booster injections. Furthermore, and perhaps most important of all, the antigenic potency of the vaccines used in the two studies may have differed considerably. Unfortunately, the material used for booster inoculations was not used elsewhere, and no data are available concerning its efficacy as a primary stimulant.

Additional data which serve to eliminate the first of these possible discrepancies are illustrated in Figure 6. The children, ranging in age from one to six years, represent a small number of those under observation in a separate vaccination study[7] and are included here because they have been followed over a period of one year, during which time they were bled before and after primary vaccination, six months later, and before and after booster inoculations. All five sera of each child were tested on the same day; furthermore, the virus-serum mixtures were preincubated for one hour at room temperature before addition to tissue cultures with the result that generally higher antibody titers were obtained. The vaccines used for the primary immunization and for the booster were different from those used in other children described in this report. The material used for the primary (309) was actually employed in the nationwide field trial of 1954.

Geometric mean antibody titers show a good primary response to vaccination, followed by a gradual decline over the intervening 12 months to a point slightly greater than prior to vaccination. The effect of the booster inoculation in these children, however, was much more pronounced than in the ones described previously in this report. In fact, the geometric mean titers after the booster should be even greater, since many sera neutralized 100 TCD of virus at the highest dilution employed (1/1,024) and many presumably might have gone much higher. The titers following the booster in all children against all three types of virus were much higher than before vaccination and in many persons the increase was from $< 1/4$ to $> 1/1,024$.

Summary

The effect of a booster inoculation of poliomyelitis vaccine on the serologic status of children vaccinated one year previously in the nationwide field trial was investigated. A total of 119 individuals in three counties were bled before and after the booster inoculation. Their serum antibody titers were determined by neutralization tests in tissue cultures and compared with the titers of their sera before and after primary vaccination.

Due to differences in the antigenic potency of the original vaccines the primary immunizations had resulted in a good response in children of one county and in a poor response in two other counties. A decline in antibody titer over the next year was observed, and the average loss appeared to be more marked in those groups which had shown the better response. The booster inoculation resulted in a sharp increase in antibody titer for all groups, but was especially effective in those who had responded poorly after the primary vaccination.

The pattern of antibody titers was observed in an additional group of younger children who were followed for the same period of time but who were tested by a more sensitive technic. In these individuals a very satisfactory response to the primary vaccination was followed by a gradual decline and an excellent response to the booster inoculation.

In spite of the difficulty of comparing results in groups receiving different vaccines in different areas, the data are of value in that they represent the serologic status of children immunized under actual field conditions and emphasize the beneficial effects of the booster inoculation one year following primary vaccination.

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(From an address given by Governor George M. Leader of Pennsylvania, August 18, 1955, at the Fourth Annual Health Conference, State College, Pa.

Inapparent Infection with Western Equine Encephalitis Virus: Epidemiologic Observations

GERALD D. LaVECK, M.D.; JOHN F. WINN, D.V.M., M.P.H.; and SARAH F. WELCH

Any communicable disease against which antibodies can be demonstrated in more than 10 per cent of the population becomes a matter of immediate public health concern. So interest in this study—confined to a part of one western state—will extend far beyond the confines of that state and that section of the country.

In recent years Weld County, Colo., has been established as an endemic focus of western equine encephalitis (WEE). Because human and equine cases were reported in this area yearly from 1937 through 1949, Weld County was selected by the U. S. Public Health Service as an area in which to conduct special encephalitis studies on various facets of the epidemiology of WEE including arthropod vectors, birds, and vertebrate hosts. During the past five years the virus has been isolated numerous times from mosquitoes and birds.[1–4]

In the spring of 1954 a survey of human sera for WEE antibodies was carried out in Weld County with the following three major objectives in mind: (1) to perform a general survey in an endemic area in order to determine the past experience of a population group with WEE infection; (2) to delineate those groups at greatest risk of infection with respect to age, sex, place of residence, length of residence, and occupation; and (3) to determine by paired sera the number of individuals who developed inapparent infections with WEE virus over a given period of time. In order to fulfill this latter objective, it was necessary to bleed again a number of individuals in the winter of 1954–1955. Therefore, by collecting specimens in the spring and second specimens from the same individuals in the winter, the number of conversions from negative to positive during the summer months might give an estimation of the activity of the virus in the area.

Methods and Material

Selection and Collection of Sera for Survey—From February through June, 1954, human blood samples were drawn from 614 inhabitants of Weld County, Colo. Blood was collected from four sources, the majority of samples being obtained from apparently healthy, adult, volunteer blood donors at the Weld County Blood Bank. The age groups 18–50 were well represented from this source. A few second specimens were obtained from persons who returned to the blood bank. There were 74 specimens from first, second, and third grade

Dr. Winn and Miss Welch are with the Public Health Service, Communicable Disease Center, U. S. Department of Health, Education, and Welfare, Atlanta, Ga. Dr. LaVeck, who had been with the department at the time this paper was prepared, is now in Seattle, Wash.

children. Of these, 63 gave second specimens in the following winter, constituting the principal source of paired sera. A small number of blood samples were from children admitted to the Weld County Hospital for various afebrile illnesses. The fourth source of specimens was from premarital and prenatal bloods submitted to the Weld County Health Department Laboratory for routine serologic determinations for syphilis. This is not intended to represent an unbiased sample of the population of Weld County: findings from this study merely reflect the trends noted in the population sampled and not necessarily the county as a whole.

Approximately 10 ml of blood were collected aseptically by a laboratory technician from each individual in the study. At the same time, the technician completed a brief questionnaire for each donor. Sera were removed aseptically and stored at —40° C. until tested.

Serologic Test—The presence of antibodies was determined by means of the serum neutralization test employing half-day-old chicks[5] obtained from a local hatchery. The L2 – 34a strain of WEE virus obtained from the Communicable Disease Center Virus and Rickettsial Laboratory at Montgomery, Ala., was used. The virus was titrated, using 20 per cent horse serum as a diluent, to find the chick LD_{50}. Each serum specimen was tested at two levels. The virus inoculum varied from 6.8 to 32 LD_{50} at the lower level and from 68 to 320 LD_{50} at the higher level. Inoculum containing an appropriate LD_{50} was added to an equal volume of serum to be tested, and the mixture incubated at 4° C. overnight. For each level, four chicks were inoculated subcutaneously, each with 0.03 ml of virus-serum mixture. The chicks were observed for 72 hours and the number of specific deaths was recorded.

The presence of specific antibodies against WEE virus was demonstrated by protection of those chicks inoculated with the virus-serum mixture. If no antibodies were present in the serum, three or four chicks would become weak and prostrate and die within 24–40 hours. In contrast, if three or four chicks lived for 72 hours, sufficient antibodies were present in the serum to neutralize the amount of virus inoculated. A serum containing enough antibodies to neutralize from 68 to 320 chick LD_{50} is considered positive, while a specimen with antibodies that neutralizes from 6.8 to 32 chick LD_{50} but fails to neutralize the higher concentration of virus is weakly positive. A result is considered equivocal when two out of four chicks survive after receiving the low concentration of virus and all four chicks die with the higher concentration.

All persons with a positive or a weakly positive serum were queried to determine whether there was a past history of clinical encephalitis.

Results

Of 614 sera tested, 30 sera protected against both levels and are considered strongly positive (++), while 37 neutralized the low level but not the high level virus and are classified as weakly positive (+). Twenty-one were found to be equivocal for antibodies. By combining ++ and + sera, 10.9 per cent of the population sampled were positive for WEE antibodies, Only one of the 67 individuals with positive serum gave a history of having had encephalitis in the past (Table 1.) This 49-year-old farmer, whose serum is now weakly positive for WEE, lives on irrigated land 15 miles south of Greeley and was hospitalized in 1940 with clinical encephalitis. The remaining persons with positive sera had subclinical or unrecognized infections with the WEE virus.

Table 1—Inapparent Infections with Western Equine Encephalitis, as Measured by Neutralizing Antibodies, Weld County, Colo., 1954, by Specified Classifications

Classification Groups	Number Tested	Results of Neutralization Tests			
		Number ++	Number +	Number Equivocal	Per cent Positive (++ and +)
Total 1954 Sera	614	30	37	21	10.9
A. Age (years)					
0–14	88	5	0	0	5.7
15–29	184	18	19	8	20.1
30–44	209	5	7	10	5.7
45–59	87	0	6	1	6.9
60 and over	47	2	5	2	15.2
B. Length of Residence (years)					
less than 1	44	1	1	2	4.5
1–4	76	5	3	1	10.5
5–9	116	6	0	2	5.2
10–14	30	0	3	0	10.0
15–19	44	3	5	2	18.2
20–24	59	4	6	3	16.9
25 and over	241	11	19	11	12.4
Unknown	4	0	0	0	..
C. Age and Length of Residence (years)					
Age Residence					
4–14 Less than 5	24	2	0	0	8.3
5 and over	64	3	0	0	4.7
15–29 Less than 10	72	6	4	4	13.9
10 and over	112	12	15	4	24.1
30 and Less than 10	81	1	0	1	1.2
over 10 and over	257	6	18	12	9.3
Unknown	4	0	0	0	..
D. Urban or Rural					
Urban	323	14	17	9	9.6
Rural	291	16	20	12	12.4
E. Place of Residence					
Greeley proper	323	14	17	9	9.6
Greeley fringe-area	76	4	5	3	11.8
Irrigated land:					
north of Greeley	95	6	7	6	13.7
south of Greeley	107	5	7	3	11.2
Nonirrigated land	13	1	1	0	15.4
F. Residence on Irrigated or Nonirrigated Land					
Irrigated	601	29	36	21	10.8
Nonirrigated	91*	11*	2*	1*	14.3*
G. Place of Employment					
Outdoors	149	13	13	6	17.4
Indoors	120	1	4	3	4.2
Similar times of both	345	16	20	12	10.4

Table 1 (Continued)

Classification Groups	Number Tested	Results of Neutralization Tests: Number ++	Number +	Number Equivocal	Per cent Positive (++ and +)
H. Occupation					
Farmers	121	9	10	6	15.7
Skilled and unskilled manual workers	79	5	7	2	15.2
Housewives	131	7	9	6	12.2
Students	110	5	2	2	6.4
Professional and semiprofessional	112	1	4	2	4.5
All others	61	3	5	3	13.1

* Includes 78 specimens collected in 1953 but tested in 1954.
++ Serum neutralizes 68 to 320 chick LD_{50}
+ Serum neutralizes 6.8 to 32.0 chick LD_{50}

Age Distribution—Individuals from 15 to 30 years of age had a prevalence rate of 20.1 per cent for WEE antibodies, which is higher than those of other age groups, as shown in Table 1-A. A second peak in the relative frequency of positive tests was noted in persons over 60 years of age among whom 15.2 per cent were positive. Although rates for persons over 60 were relatively high, a low percentage of positives occurred in those from 30 to 60 years of age.

Sex Distribution—In Weld County, 11.7 per cent of 384 males and 9.6 per cent of 230 females were positive for antibodies as given in Table 2-A. The percentage of positive sera was higher in males than in females in the age group 15 through 29 years, but in those over age 45 the relationship was reversed.

Length of Residence—Individuals who had been residents of Weld County for the past 15 to 24 years had an appreciably higher rate of WEE positive sera than all other residents in the same county (Table 1-B).

By considering both age and length of residence at once, some of the confounding of each in tabulating the other can be resolved (Table 1-C). Of the 88 children, 32 could be listed as definite immigrants with three positives, which cannot be regarded as different from the 56 resident children. Young adults (15–29) still have the highest percentage of positives no matter how they are classified. In this group, residents of at least 10 years revealed 24.1 per cent positive, whereas those with less than 10 years' residence had 13.9 per cent positive. Adults over 30 years of age with at least 10 years' residence had 9.3 per cent positive, and those with less than 10 years' residence had only 1.2 per cent positive.

A study of the sex distribution as related to length of residence revealed that, among those who had lived in the area for less than 20 years, the rate of positives was appreciably greater in males than in females. However, the rate of positives was higher in females than in males for persons in residence 25 years or more (Table 2-B).

Geographic Distribution — Neutralizing antibodies against WEE were detected in 12.4 per cent of the rural and 9.6 per cent of the urban population

Table 2—Inapparent Infections with Western Equine Encephalitis, as Measured by Neutralizing Antibodies, Weld County, Colo., 1954, by Sex and by Age or Length of Residence

Classification Groups	Males					Females				
	No. Tested	No. ++	No. +	No. Equivocal	Per cent Positive (++ and +)	No. Tested	No. ++	No. +	No. Equivocal	Per cent Positive (++ and +)
Total Sera	384	20	25	13	11.7	230	10	12	8	9.6
A. Age (years)										
0–14	40	2	0	0	5.0	48	3	0	0	6.2
15–29	109	14	14	4	25.7	75	4	5	4	12.0
30–44	156	4	5	7	5.8	53	1	2	3	5.7
45–59	57	0	3	1	5.3	30	0	3	0	10.0
60 and over	22	0	3	1	13.6	24	2	2	1	16.7
B. Length of Residence (years)										
less than 1	17	1	1	0	11.8	27	0	0	2	..
1–4	47	4	2	0	12.8	29	1	1	1	6.9
5–9	65	3	0	2	4.6	51	3	0	0	5.9
10–14	17	0	3	0	17.6	13	0	0	0	..
15–19	25	3	3	2	24.0	19	0	2	0	10.5
20–24	43	4	4	2	18.6	16	0	2	1	12.5
25 and over	168	5	12	7	10.1	73	6	7	4	17.8
Unknown	2	0	0	0	..	2	0	0	0	..

++ Serum neutralizes 68 to 320 chick LD_{50}
+ Serum neutralizes 6.8 to 32.0 chick LD_{50}

sampled (Table 1-D). According to descriptions of past epidemics,[6] clinical case rates were greater in rural populations, where exposure to the mosquito vector is presumably greater. The results of this study of inapparent infections in rural and urban populations do not parallel the findings of past outbreaks of clinical infections. The division into rural and urban groups in Weld County may be artificial since the only urban district is Greeley, a town of 21,000 people. Although this is defined as an urban area by the U. S. Bureau of the Census, it may well be classified ecologically as a rural area; thus, the entire population studied might be considered rural and the separation into rural and urban groups of no significance.

Weld County was divided into five regions to determine in which area the population was at greatest risk of exposure to the virus. Table 1-E shows that the sampled populations of all areas had similar percentage positives for WEE antibodies.

Past surveys in 1950 and 1951[7] demonstrated that antibodies were found relatively more frequently in persons living on irrigated land (12.5 per cent) in Weld County than in those living on nonirrigated land (5.7 per cent). This may be due to the lower Culex tarsalis population in nonirrigated areas. Unfortunately, the present survey did not include a sufficiently large sample from nonirrigated land to re-evaluate this relationship. However, for a comparison, laboratory tests were

performed on 78 specimens which had been collected in 1953 from inhabitants of Nunn, Colo. This small town of 395 population is located 20 miles north of Greeley in nonirrigated territory. By including these samples with those obtained in 1954, 10.8 per cent of sera from persons residing on irrigated land were positive as compared with 14.3 per cent on nonirrigated land, Table 1-F. Therefore, it would appear from this survey that inhabitants of both irrigated and nonirrigated areas have been subjected to similar risks of developing inapparent infections with WEE virus.

Occupation—In order to determine the effect of occupation on inapparent WEE infections, the sampled population was classified into three groups. Table 1-G reveals that 17.4 per cent of the population whose occupations required a great deal of outdoor activity had antibodies while only 4.2 per cent of those employed indoors had demonstrable antibodies. The group that worked both indoors and outdoors was intermediate with 10.4 per cent positives. The three groups are similar in regard to sex distribution and place of residence, but the group that worked both indoors and outdoors contains a number of students which lowers the age distribution in that group. However, the comparison between the indoor and outdoor categories is probably valid. As might be expected, farmers and manual laborers lead other occupational groups in percentage of positive reactions (Table 1-H).

Incidence of Inapparent Infections—To determine the incidence of inapparent WEE infections developing during the summer of 1954, sera were obtained in the following winter from 78 volunteers who had been bled in the spring. Sixty-three paired sera were from pupils in one school in Greeley, and 15 pairs of sera were collected from donors at a blood bank.

Five individuals with paired sera had WEE antibodies in both specimens. The remaining 73 pairs were negative for specific antibodies. From this small and biased sample there was no evidence of inapparent WEE infections acquired during the summer of 1954. Just one clinical case of WEE was reported in Weld County during the year. Additional sera from a number of individuals tested at regular intervals might clarify the relationship between clinical and subclinical infections and reveal the patterns in which subclinical infections may be manifested in the host.

Discussion

In this study sera that neutralize 6.8 to 32.0 LD_{50} and sera that protect against 68 to 320 LD_{50} are both considered positive. A two-level screening procedure was used rather than determining a neutralization index, because of the simplicity and the sensitivity of the former. A preliminary survey was conducted in Weld County in 1950 and 1951 [7] in which 10.6 per cent of the population sampled had WEE antibodies. Mice were employed as the laboratory animals and a neutralization index of 50 or greater was considered positive; an index of 32 to 50 was classified as equivocal. By including both ++ and + sera as positive in the 1954 survey, 10.9 per cent of the sera had antibodies. Therefore, this 1954 study, which employed chicks, is in close agreement with the 1950 and 1951 survey in which mice were used.

A serum which neutralizes no more than 6.8 to 32 chick LD_{50} of virus may represent a waning antibody titer from a previous infection with WEE virus. An equivocal result may denote an even lower antibody titer due to a still longer period of time since infection. Higher rates of weakly positive and equivocal sera are noted in individuals who have

resided in Weld County for more than 15 years.

Outbreaks of clinical arthropod-borne encephalitis were reported each year in Weld County during the summer seasons from 1938 through 1941 and to a lesser extent in 1944 and 1949. Past epidemics in California and elsewhere indicate that the attack rates for clinical WEE infections are frequently highest in infants, young children, and elderly people.[8, 9] An explanation for Weld County's high rates in groups under age 30 might be resolved by the fact that the severe outbreaks from 1938 through 1941 resulted in subclinical or undiagnosed WEE infections in children and in older individuals in their fifties and sixties. After 14 to 17 years high rates are still present in these same persons now 15 to 30, and 60 years of age and over. Residents of Weld County who have lived in the area for the past 15 to 24 years showed a higher rate of positive sera than other residents. This is in accordance with the premise that many of these people were infected during 1938 to 1941 outbreaks and have retained serum neutralizing antibodies since that time.

Several hypotheses may be proposed from these results. The young adult immigrants in this study apparently had an appreciable exposure before moving to Weld County. Older immigrants either came from clean areas and were not subjected to exposure, or had reverted to serologic negatives and were not re-exposed. Older adults in general had lower percentages of positives. The total data lend credence to a theory of Weld County being an enzootic area with age-sex-occupational hazards defining the exposure and re-exposures, and WEE being a disease which produces an immunogenic response that may not be serologically evident after a period in the magnitude of 1–10 years without re-exposure. For example, the predominance of positive sera from individuals under age 30 years as compared to those over age 30 might be due to an increased exposure to mosquitoes because of occupational differences. It is known that Culex tarsalis bites human beings most frequently just prior to darkness.[10] Many farmers, filling station attendants, ranchers, and others employed outside work in the evenings and are exposed to bites at that time. Although this undoubtedly is a factor, indoor as well as outdoor workers under age 30 had higher rates of positive sera than indoor or outdoor workers over age 30. From these data it is our impression that the age distribution of persons with positive sera is not entirely a function of occupation but may be the effect of unknown factors.

Observations from past experience in California [8] and Colorado [7] indicate that clinical attack rates for WEE are about twice as high in males as in females. It has been suggested that this may be a reflection of occupational differences and the opportunity for exposure. Lennette and Longshore [6] have stated that such an explanation is not entirely satisfactory because the differences in sex distribution are also noted in childhood age groups. In this study 11.7 per cent of males and 9.6 per cent of females had had inapparent infections as evidenced by WEE antibodies. The percentage of positive sera was higher in males than females in the 15- to 30-year-age group, but the relationship was reversed in those over 45 years of age. This is not in complete agreement with the published sex distribution of clinical infections.

Although the sample of paired sera is inadequate to make an evaluation, the lack of conversions and the rarity of clinical encephalitis cases emphasize the low risk of infection for human beings during the summer of 1954.

Because of unfavorable climatic factors the mosquito population was low in Weld County in 1954. A more extensive study would be necessary to estimate the conversion rate of inapparent infections.

Summary

Sera obtained from 614 inhabitants of Weld County, Colo., during 1954 were tested for neutralizing antibodies against WEE to determine the frequency and epidemiologic pattern of inapparent infections. Antibodies were demonstrable in 10.9 per cent of the sampled population. For persons under 30 years of age the rate of positive sera was twice as high as that for persons over age 30. Although males and females had similar rates when all ages were considered, the percentage of positives was greater in males than females in the age group 15 to 30 years, but was higher in females over age 45. Residents who had lived in the county for the past 15 to 24 years had higher rates than other residents. No significant difference was noted in the frequency of inapparent infections in rural and urban areas nor in irrigated and non-irrigated land. A higher per cent of persons with outdoor employment had positive sera than those with indoor employment. Farmers and manual laborers led other occupational groups in percentage of positive reactions.

Seventy-eight individuals were bled in the spring of 1954 and again in the fall to determine the incidence of inapparent WEE infections during the summer months. None converted from negative to positive.

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Cancer Research Grants to Scholars

The Committee on Growth of the National Academy-Research Council invites applications for Grants for Scholars in Cancer Research offered by the American Cancer Society to assist institutions in the support of young scientists during the critical early period of their careers as independent investigators. Annual grants of $6,000 are awarded for three years with usual renewal for two additional years.

Applications should be submitted by institutions on behalf of candidates not later than January 1, 1956. Applications blanks from: Executive Secretary, Committee on Growth, National Academy-Research Council, 2101 Constitution Avenue, N.W., Washington 25, D. C.

Summary of Federal and State Alcoholism Programs in the United States

JOHN A. LEWIS, M.D., F.A.P.H.A.

The phenomenal growth of the public health attack upon alcoholism is pointed up in this brief report. "Ten years ago there was not a single state having a formal program for alcoholism. Now there are thirty-four . . ." an encouraging record indeed!

Information about state alcoholism programs presented here is gained from surveys made for the National States Conference on Alcoholism (October, 1954) and for the Licensed Beverage Industries, Inc. (1955) and from reports of the regional mental health consultants, U. S. Department of Health, Education, and Welfare.

Our over-all approach in the Public Health Service is based on the assumption that alcoholism is a symptom complex, a reaction syndrome related to deeper problems of the individual personality, his emotional maturity, psychological and physiological functioning, and his interactions with significant other persons. Facilities and services for alcoholism are considered to come within the scope of the National Mental Health Act. Recommendations are made to state agencies that alcoholism be considered a public health problem, and as such, should be subjected to methods applicable to other public health activities: determination of the extent of the problem, analysis of the situations in which alcoholism occurs, case finding, early diagnosis, treatment, and public education. Treatment and rehabilitation are conceived broadly to include any combination of measures, medical, psychological, social, economic, taken collectively which are useful in assisting the patient to achieve continued sobriety and adjust more successfully to his family and community, with greater satisfaction for himself.

The federal government does not have an administrative unit specifically assigned to do something about alcoholism as a public health problem. The focal point in the Public Health Service for coordinating activities for alcoholism is the Community Services Branch, National Institute of Mental Health, which with the Bureau of State Services directs the consultation and other assistance provided by the Regional Offices to the state alcoholism programs. In 1954 a grant was made by the Training Branch of the National Institute of Mental Health for an institute held by the National States Conference of Alcoholism Programs to review research in the alcoholism field. Grants are available to qualified applicants, individuals, or groups for training and for research in this field. Intramural research on alcohol addiction is carried on at the Public Health Service Hospital, Lexington, Ky.

Ten years ago there was not a single state having a formal program for alco-

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This paper was presented at the Round Table on Alcoholism, American Psychiatric Association in Atlantic City, N. J., May 10, 1955.

holism. Now there are 34, of which 31 have operating programs; three states have groups appointed by their legislatures or governors to study the problem. The total amount of public funds appropriated for the latest known year (1954 or 1955) for all state programs was $3,053,348. These figures range from $7,007 for Montana to $400,575 for Florida. Twelve states [1] appropriated more than $100,000. There is considerable variation among the states in the per capita amounts expended. These vary from 23 cents per capita per year in New Mexico to three-tenths of a cent in Mississippi and Minnesota. In addition to these formal programs, there are other public expenditures, the total amount of which cannot be estimated, made by state and local health and welfare agencies in attempts to alleviate the problems caused by alcoholism. Included in this category are the sums spent for hospitalization of alcoholics in state mental or other institutions, public health nursing, health education, child welfare services, and services provided for alcoholics and their families in local mental health clinics.

The first state program was established in Connecticut in 1945 as a commission independent of other health and welfare agencies. Since then 12 [2] additional states have created independent agencies. Eighteen state programs are integrated with other state health or welfare agencies. Ten [3] of these operate as units of state health departments. Three [4] are in state mental health agencies, two [5] in welfare departments and two [6] in departments of institutions.

Of the state programs, five engage only in educational activities. One in education and research, 11 in education and treatment, and 11 in education, treatment, and research. Seventeen [7] states have no operating programs. A

Expenditures for Alcoholism Programs by States

State	State Funds	Per capita Expenditure
Alabama	$ 16,000	0.005
Colorado	10,000	0.003
Connecticut	330,578	0.165
District of Columbia	125,000	0.156
Florida	400,575	0.199
Georgia	188,000	0.005
Indiana	30,000	0.001
Kansas	50,000	0.026
Louisiana	85,000	0.032
Maine	9,000	0.009
Maryland	35,000	0.015
Massachusetts	113,200	0.024
Michigan	106,445	0.017
Minnesota	7,500	0.003
Mississippi	7,065	0.003
Montana	7,007	0.012
New Hampshire	75,000	0.141
New Jersey	47,000	0.009
New Mexico	154,058	0.226
New York	182,815	0.012
North Carolina	172,092	0.042
North Dakota	7,500	0.012
Ohio	150,000	0.019
Oregon	81,147	0.053
Pennsylvania	250,000	0.024
Rhode Island	86,240	0.109
Tennessee	75,000	0.023
Utah	25,000	0.036
Vermont	26,000	0.069
Virginia	134,230	0.040
Wisconsin	66,896	0.019

1. Connecticut, District of Columbia, Florida, Georgia, Massachusetts, Michigan, New Mexico, New York, North Carolina, Ohio, Pennsylvania, Virginia

2. Alabama, Colorado, Georgia, Kansas, Louisiana, Michigan, New Mexico, North Dakota, Oregon, Tennessee, Texas, Vermont

3. District of Columbia, Indiana, Maine, Maryland, Massachusetts, Montana, New Hampshire, New Jersey, Pennsylvania, Virginia

4. New York, North Carolina, Ohio

5. Minnesota and Wisconsin

6. Florida and Louisiana

7. Arizona, Arkansas, Colorado, Delaware, Idaho, Illinois, Iowa, Kentucky, Mississippi, Missouri, Nebraska, Nevada, Oklahoma, South Carolina, South Dakota, Texas, Wyoming

wide variety of research projects are carried on by the 11 states. Examples of these are studies such as hormonal investigations, the effects of vitamins, the effects of pharmacological agents such as Antabuse and tranquillizing drugs such as chlorpromazine, the psychological characteristics of alcoholics, individual and group psychotherapy, sociodrama and psychodrama, studies of incidence and prevalence, estimations about the cost of alcoholism to the community, the use of alcohol by high school students, the relationship of alcoholism to crime, the effect of alcoholism on family life and the problems of "skid-row" alcoholics.

There is a definite trend for states to develop specific programs to coordinate activities on a state-wide basis of a research, treatment, and educational nature since Connecticut first established its program 10 years ago. Each year the total sums of public moneys appropriated for these purposes have increased. There is still a long way to go before it can be said that there are coordinated, nation-wide efforts to prevent alcoholism and rehabilitate those afflicted.

Atomic Energy Commission Industrial Medicine Fellowships

The U. S. Atomic Energy Commission is offering to physicians for the year 1956–1957 eight fellowships in industrial medicine. The selection is made by AEC on the recommendation of a Committee on Fellowships whose chairman is Dr. Henry A. Blair, director of the atomic energy project at the University of Rochester. Final date for receipt of applications for fellowships beginning July 1 or the fall of 1956 is January 1, 1956.

Physicians to be eligible must have been graduated from an approved college of medicine at least two years prior to beginning tenure of the fellowship, must be United States citizens licensed to practice in one of the states or territories, and will be required to have a full FBI background investigation and be cleared by the commission prior to fellowship award.

The training program consists of an academic year at a university offering an approved graduate course in industrial medicine that can provide special training facilities in the health problems associated with the atomic energy program. A second year is devoted to inplant training at AEC contractor installations, such as Oak Ridge, Los Alamos, Richland, or others with major industrial medical units.

Stipend for the first year is $3,600 plus $350 for each dependent and an allowance for tuition and laboratory fees. The inplant year carries a stipend of $6,000. Normally, this year follows the academic year but the commission is not obligated to provide the second year's fellowship nor is the fellow obligated to take the inplant training year. The fellow has no obligation to seek employment with AEC nor does AEC have obligation to provide employment upon completion of training.

Further information from Dr. Henry A. Blair, AEC Fellowships in Industrial Medicine, University of Rochester, Rochester 20, N. Y.

Applications of Germicidal Ultraviolet in Infectious Disease Laboratories

I. Sterilization of Small Volumes of Air by Ultraviolet Irradiation

ORRIN T. MILLER; RICHARD F. SCHMITT; and G. BRIGGS PHILLIPS

Bacteriological laboratory staffs engaged in studies or services in which infectious aerosols or other air contaminants are discharged will welcome the safeguards suggested by this research.

Exhaust air from forcibly aerated bacterial cultures often contains viable organisms (Table 1). The air from small airtight chambers used for study of bacterial aerosols or used for respiratory challenge of small animals likewise contains residual organisms. In both instances the exhaust air should be sterilized if the organisms are infectious for man.

Possible methods for treatment of such air are electrostatic precipitation, filtration, incineration, steam sterilization, and ultraviolet (UV) irradiation. Although each method has certain advantages and disadvantages, sterilization by UV seems suited to the situations outlined above. Though UV irradiation is often impractical as a means of sterilizing large volumes of moving air because the lamps required take up too much space, this limitation does not apply to small volumes of air at relatively low flow rates. UV irradiation offers these advantages: (1) no resistance to air flow; (2) no significant generation of heat; (3) relatively inexpensive; (4) low operational cost; and (5) portability and light weight.

Several UV sterilizers for small volumes of air were constructed and tested prior to the development of the apparatus described below. These consisted of one or two high intensity UV lamps, sometimes in combination with high ozone producing lamps, inclosed in glass or aluminum tubes. Tests showed that these models did not sterilize air containing bacterial spores, although all vegetative bacteria were killed. The model selected for final evaluation employed four UV lamps.

Description of the UV Air Sterilizer

The sterilizer consists of four aluminum tubes so joined by small airway pipes that air, entering at the end of one tube, flows over the UV lamp in that tube and out the other end into and then out of each of the other three tubes in turn, before finally leaving the sterilizer (Figure 1). Each tube is 35 inches long and 1⅜ inches in diameter and contains one G36T6 UV lamp.* These lamps produce relatively large amounts of 2537A radiations and have a life expectancy of 6,000 hours. Each lamp is positioned and sealed in the aluminum tube by means of two rubber stoppers, one at each end of the tube. The lamps are operated from an outside ballast supplying 420 milliamperes current to each lamp.

* Westinghouse Electric Corporation.

Table 1—Organisms Recovered From Exhaust Air of Forcibly Aerated Broth Cultures of Serratia indica

Aerated Culture *	Rate of Air Flow in Cubic Feet Per Minute	Organisms Recovered Per Cubic Foot of Exhaust Air
50 ml in a 250 ml Erlenmeyer flask	0.46	1.78×10^4
100 ml in a 500 ml Erlenmeyer flask	0.46	2.18×10^4
200 ml in a 1,000 ml Erlenmeyer flask	0.46	1.64×10^5

* Concentration of S. indica culture was 3.3×10^8 organisms per ml. Results are an average of three experiments.

The apparatus has a total volume of approximately 0.092 cubic feet and weighs 20 pounds. It is designed for a flow rate of 1 cfm of air. At this flow the exposure time of air-borne particles in the sterilizer is calculated to be 5.52 seconds (1.38 seconds per tube). Each UV lamp used in the test model produced a total UV output of approximately 13 watts. In operation the temperature of the air in the sterilizer was 116.6° F.

Test Methods

Spores of Bacillus subtilis var. niger (referred to as B. globigii in previous publications) were used as the major test organism. Bacterial aerosols were generated with a Chicago type glass nebulizer (Rosebury, 1947) and passed through the sterilizer. The exhaust air from the apparatus was sampled with the lamps on and off. The off samples were collected by passing the air through a small tube filled with sterile cotton. Collected spores were subsequently washed from the cotton and plated in the usual manner. The on samples were collected by sieve-type samplers (duBuy and Crisp, 1944) or slit samplers (Decker and Wilson, 1954). The concentration of spores entering the tube was determined with cotton samplers.

Spore suspensions of approximately 1×10^8 spores per ml were nebulized at the rate of 2–3 ml per minute for two to four hours continuously. Tests were conducted using one, two, three, and four radiant lamps.

Results

Three separate experiments, representing over eight hours of nebulizing during which the aerosol concentration entering the sterilizer varied from 3.8×10^7 to 4.1×10^7 spores per cubic foot of air, showed that the use of four lamps killed all test organisms in the exhaust air (Table 2). Experiments in which less than four lamps were lighted in the apparatus proved that sterility could also be obtained with three lamps, but two lamps and one lamp gave penetrations of 0.000002 and 0.0002 per cent, respectively. Additional tests at increased air flows of 4 and 10 cfm showed that aerosols of Serratia indica could be sterilized by four radiant lamps (Table 2).

The authors are associated with the Agent Control Branch, Safety Division, Camp Detrick, Frederick, Md.

Discussion

UV lamps have been used successfully in room air conditioners to treat recirculated air (Harstad, Decker, and Wedum, 1954). UV irradiation gave a 99.98 per cent reduction of air-borne S. indica in a system with an air flow of about 310 cfm.

The results of the studies with the UV air sterilizer show that it is an efficient means of sterilizing small

Figure 1—Small Volume UV Air Sterilizer

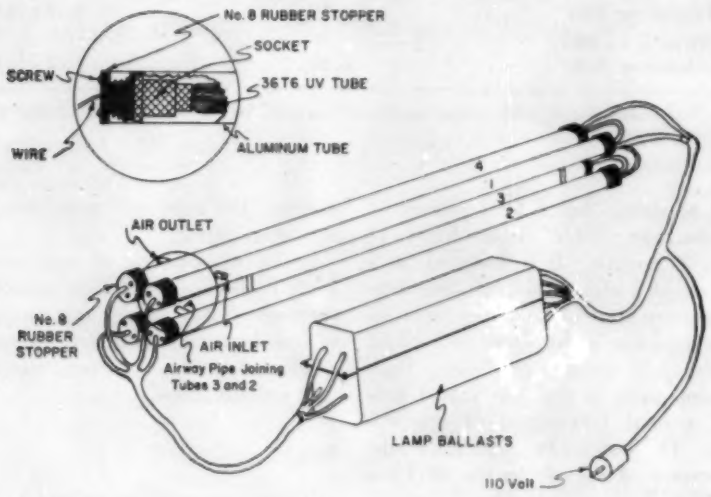

Table 2—Comparative Efficiency of One to Four UV Lamps in the Ultraviolet Sterilizer in the Presence of Aerosols of B. subtilis Spores and Serratia indica *

Number of Radiant Lamps Burning	Test Organism	Cubic Feet of Air Per Minute	Sampling Time Minutes	Organisms Per Cubic Foot Entering Apparatus	Organisms Recovered Per Cubic Foot	Per cent Penetration
4	B. subtilis spores	1	77	4×10^7	0	0
3	"	1	10	4×10^7	0	0
2	"	1	20	4×10^7	1.	0.000002
1	"	1	15	4×10^7	76.5	0.0002
4	Serratia indica	4	10	1×10^8	0	0
4	"	10	180	2×10^8	0	0

* Results are an average of four experiments.

volumes of highly contaminated air and that the use of four lamps in the apparatus provides a generous safety factor. In practical applications several important maintenance considerations must be kept in mind. Since visual inspection of a lighted UV lamp is not an accurate method of estimating UV output, no inspection windows have been provided in the apparatus. The outside temperature of each of the aluminum tubes will indicate if the enclosed lamp is burning. Records should be kept of the periods of use of the apparatus so that replacement lamps may be installed after approximately 6,000 hours of use. In addition, the lamps should be cleaned by wiping with alcohol after each 1,000 hours of use. Small intensity meters, such as the Westinghouse SM-600 meter, may be used periodically to check the UV output. A lamp should be replaced when it tests less than 60 per cent of its initial output. Formaldehyde vapors may be used to sterilize the entire apparatus before removing burned out lamps.

Summary

A UV sterilizer is described which is capable of eliminating high concentrations of bacterial spores from air at a flow rate of 1 cfm and high concentrations of vegetative cells at 10 cfm. The apparatus utilizes four G36T6 UV lamps enclosed in aluminum tubes. The advantages of UV treatment of contaminated air from aerated bacterial cultures and small aerosol chambers are indicated and maintenance procedures are given. It is suggested that the apparatus may be employed to sterilize small volumes of air containing infectious microorganisms.

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Florida Medical and Dental Scholarships

The Florida Legislature has provided for 10 state-financed scholarships each for medical students and for dental students who are Florida residents in need of financial assistance and who will agree to practice for five years in a Florida small community or rural area in need of medical or dental services. Grants of up to $1,000 annually for four years are provided. The program is administered by the State Board of Health.

The candidates are chosen on the basis of scholastic record and need for financial assistance. In the selection of medical candidates, the State Board of Health has the help of a Medical Advisory Committee made up of the president of the State Medical Society, the secretary of the State Board of Medical Examiners, four state medical school deans or other officers, and a practicing physician who is chairman. Dental candidates are screened by the Scholarship Committee of the State Board of Dental Examiners and the director of the Bureau of Dental Health of the State Health Department.

Consultation in Public Health

JAMES F. MADDUX, M.D.

In matters of health agency organization the title "Consultant" is sometimes conferred rather loosely upon a staff member whose work extends into areas of supervision or administration. A clarifying discussion of the nature of the consultative process and the role of the consultant is offered here.

Consultation, or something akin to it, has been practiced since the first time one man turned to another for advice or counsel. It is probable that most professional persons have at some time consulted, or been consulted, although they may not have called it consultation. A number of articles on consultation appear in the recent literature of medicine,[1, 2] psychiatry,[3–7] public health,[8–11] nursing,[12–18] adult education,[19, 20] and social work.[21–23]

Training in consultation does not ordinarily appear in the formal curriculums of any of the above disciplines, but need for training in consultation is acknowledged in the literature,[4, 9, 14] and recognition of such need is further evidenced in occasional seminars and conferences on consultation in the fields of social work and public health.

Consultative Relationship

Regardless of the organizational or professional setting there appear to be common features of consultation. Towle's comment[23] is a good starting point for discussion of these features: "Consultation involves the giving and taking of help in an interpersonal relationship."

Ordinarily, consultation is initiated by the consultee's calling on the consultant for assistance. The assistance may be requested on a specific problem or problems of immediate urgency or on general, continuing less urgent ones. It may be utilized once in a time of need, or intermittently over an indefinite period.

The outstanding feature of the relationship is its permissiveness. The individual (or group, or agency) is free to seek or not to seek the consultant's assistance. Having received advice, opinion, or information from the consultant, the responsibility and decision for using or rejecting such advice remain with the consultee. The consultant has no responsibility for, or authority over the actions of the consultee. Implicit in the relationship, however, is the authority of the consultant's knowledge, special skill, and professional conscience.[23]

Like most human relationships, consultation is a two-way process.[7] Although the balance is usually weighted toward giving by the consultant, and receiving by the consultee, the consultant also receives and the consultee gives. While the consultant may have a store of knowledge relevant to the problem area, his giving effectively is dependent upon receiving facts, impressions, and opinions about the unique problem of the consultee. The relationship may be characterized by successive reversals of giving-receiving direction. Presumably, a consultant could extend his knowledge indefinitely by learning from successive consultees.

The emotional interaction between consultant and consultee is a prominent determinant of the effectiveness of the

relationship. Inevitably, personal emotional needs, characterological and circumstantial, are brought to the consultative relationship; and depending upon their nature and intensity, the relationship may be richly productive, or it may fail altogether. Not infrequently, seemingly inexplicable feeling intrudes into the relationship. Discussion of this "irrational" feeling requires a brief excursion into an area which is sometimes referred to as psychodynamic theory.

The quality and intensity of the emotional needs of the individual seem to be determined in large part by his previous life experiences and the demands of his current life situation. Every person expends effort in maintaining a sense of security and self-esteem and in gratifying impulses toward productivity and creativity. When his emotional needs are insufficiently gratified the person experiences anxiety and perhaps hostility. At some point of mounting frustration the person begins to erect psychological defenses (repression, denial, regression, displacement, rationalization, etc.) which aim to reduce anxiety and permit a measure of gratification. These defense measures appear to be universal and essential for survival. As an added convenience for the individual, they are brought into use automatically and unconsciously as need arises.

The sources of feeling which may be brought to the consultative relationship are the gamut of human experience; the feelings themselves are often cryptic, concealed beneath complicated layers and combinations of defenses.

It appears that the consultative relationship is especially likely to mobilize feelings about dependency and authority. Some people seem unable to tolerate a need for help in themselves; some cannot tolerate needs for help in others. At the other extremes, some must work incessantly to create situations of dependency for themselves, or for others. Most people are somewhere between the extremes. The point to be made here is that the asking for, and the giving and taking of help in the consultative relationship, is likely to stir up preexisting dependency attitudes and perhaps to require activation of defensive measures.

Related to the dependency issue is the consultee's fear that using consultation represents an acknowledgment of, or will lead to exposure of, his inadequacy. Somewhat similarly, the consultant may be afraid that giving consultation may expose lack of knowledge or other inadequacy on his part. Such anxiety may be neurotically or realistically based. In sufficient quantity it can severely handicap the relationship.

Although directive authority does not exist in the consultative relationship, there is the previously noted authoritative component. Here, again, preformed patterns of response are likely to come into play. Consultant and consultee are likely to have some kind of habitual response to a situation of authority: acceptance, rejection, submission, rebellion, or any gradation or combination of these.

Another emotionally charged issue on the consultant's side of the relationship is the problem of work gratification. The professional person has invested considerable effort in learning to perform a highly technical job, and much of the pay-off of his investment comes from exercise and demonstration of his acquired skill. In consultation he is not ordinarily permitted to perform the task for which he was trained; he is required to help someone else do the job. His gratification must come, at least in part, from seeing someone else succeed; and

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he needs the endurance to permit another to fail at a job in which he thinks he could have succeeded. The consultant's frustration in this area sometimes prompts him to take over and attempt to do the job for the consultee.

Elements of the Process

Review of the literature and many case conferences on consultation make it appear that several elements occur regularly in the consultation process, although they may not be described precisely as given below. It will be attempted to describe these elements in something of chronological order, although they do not always appear in this order, and some of them appear recurrently, or continually throughout the process. A single consultative conference may not contain all these elements.

1. Request for Assistance—The potential consultee becomes aware of a problem, or group of problems, and suspects that some person who has special knowledge or skill in the problem area might be of assistance. His request for assistance may present a clearly defined problem with specific questions, or it may have a diffuse, unfocused quality. It may ask specifically for information, opinion, or for special service, such as a survey or study. The diffuse request can arise from difficulty in defining the problem, or from uncertainty about the consultant's possible contribution.

2. Development of Rapport—An adequate working level of mutual trust and confidence is necessary for effective giving and taking of assistance. Some of the factors influencing the growth of rapport between consultant and consultee are their understanding and acceptance of the consultative relationship, current personal needs, the nature of the problem, and the progress of the consultative process. Its development involves a mutual testing of attitudes, interests, and knowledge.

Verbal clarification of the relationship may be helpful, as well as acknowledgment of emotional responses to the problem, the relationship, or the process. Recognition and acceptance of anxious or hostile feeling may be essential to the development of rapport. As in other interpersonal relationships, attitudes conveyed by nonverbal communication (facial expression, tone of voice, body posture, body movements, etc.) have appreciable influence.

3. Diagnosis—It has been stated earlier that appropriate application of the consultant's knowledge requires adequate understanding of the unique problem of the consultee. Preliminary diagnostic work may be done by consultant and consultee prior to direct conference. The consultant may have, or be able to obtain, informational material in advance; and the consultee may, in advance, gather data and attempt to define questions.

In the consultative conference the consultant may obtain information by encouraging the consultee to talk about the problem. This may be facilitated by comments acknowledging (or testing) the consultant's understanding of the material being presented, by questions, and by comments reflecting the consultee's feeling about the problem. In the diagnostic portion of the process the consultant's knowledge is useful as a base from which to explore and evaluate the relevant factors of the problem. Assisted by comments and questions of the consultant, the consultee also participates in the diagnostic process. Differences between the consultee's perception of the problem and the consultant's perception of the problem may emerge and be explored. Direct examination of the problem by the consultant may in some instances be desirable.

4. Working Through—For lack of a better term, this concept is borrowed

from psychotherapy. The diagnostic portion of the process merges into this one and "working through" may begin relatively early in the consultative process. It consists of movement toward new insights, new perspectives, and consideration of possible courses of action. The possible results of different courses of action are considered. Unrealistic expectations of consultant and consultee tend to be dissipated in this phase of the process. This disillusionment may be frustrating, but if the process proceeds effectively, both participants should emerge in a wiser although perhaps sadder condition.

In so far as consideration of courses of action is concerned, the perceptions, motivations, and needs of the consultee are most important, since the consultee has the responsibility for decision and action. Stokes[17] has proposed that consultation should be tailor-made, individualized for the users. It appears that the major contribution of the consultant is often the quality of emotional support, encouragement, and stimulation he can provide, rather than the delivery of special information or knowledge. This does not mean that expert knowledge is less important; on the contrary, the authority and relevance of special knowledge or skill are essential to providing the emotional support. Reassurance derived from consultation is gradually built up from components of the entire process.[4]

5. Termination—The process may end with the consultee having arrived at decision for action and with the process having contained all of the above elements. It may also end at any phase, perhaps with inadequate rapport blocking progress, or with the complexity of the problem or lack of information permitting only partial diagnosis. This might be called premature or abortive termination. It may end with the mutual conclusion that the problem appears insoluble. It may end with decision for further study by consultee or consultant, or with planning for future consultation.

Termination may bring some feeling of anxiety, or grief, or relief, depending upon the quality and intensity of the emotional interaction between consultant and consultee.

Consultation and Other Relationships

There are a number of professional activities which have similarity to consultation in that they occur in interpersonal relationships, they involve giving and taking of help, and there may be similar elements in the process. Among these are supervision, administration, and teaching. Supervision differs from consultation in that the supervisor is responsible for and has control over the work of the employee. Administration implies similar responsibility and authority. Teaching differs from consultation in that its goal is development of skill and knowledge, although it may utilize problem-solving methods. Consultation, on the other hand, emphasizes problem solving as the final goal, although there may be incidental growth in skill and knowledge.

It probably never occurs that a professional person serves exclusively as a consultant. In public health agencies, a position of "consultant" is likely to include not only consultative duties, but also some supervisory or administrative duties, teaching or training activities, perhaps some responsibility for inspections, or for licensing, for direct service, and perhaps more or less well defined responsibility for promotion of a special health program or service. In the Public Health Service and in state health agencies, the consultant may also be concerned with administration of grants of money to other agencies.

It is not surprising that a consultant sometimes unwittingly carries over his

supervisory, or administrative, or teaching behavior into consultation. A circumstance in which confusion is likely to be compounded is that in which the consultant has to act at different times in different roles with the same person. The professional health worker may have to shift promptly, flexibly, and repeatedly from one role to another, and some grating of intellectual and emotional gears is likely to occur. Precision in the consultative process will be facilitated if the consultant gives meticulous attention to need for clarifying his several roles with persons and agencies with whom he works.

Administrative Integration

In so far as an agency has internal consistency and cohesion, the behavior of its representatives is likely to be clear, focused, and predictable. Consultant, and consultee as well, are influenced by agency goals, agency structure, the quality of administrative leadership, the effectiveness of communications, the adequacy of financial support, and by other factors affecting the level of integration of the agency.

Administrative pressure to achieve certain agency goals may prompt the consultant to attempt to give consultation where it may be neither needed nor wanted. The consultee in an agency may be in the position of having someone else, perhaps a supervisor, decide that he needs consultative service. Or an agency employee may want consultation but be unable to convince the agency executive that he needs it.

Dement [9] has emphasized the importance of coordination of consultative services provided by a state health department to local health departments, and he notes the disruptive effect on local health departments of fragmented consultation from special consultants of a state health department. In some state health agencies, and in the Public Health Service, the structure often provides for divided administrative and technical supervision of the consultant, with the disadvantage that control and accountability are not clearly fixed, and the employee may work in a condition of uncertainty over whom he is responsible to for what. A study of public health nursing consultants by Porter [10] revealed confusion in a number of state health departments on this issue.

While this situation permits conflict, and it may make the consultant and his supervisors feel uncomfortable, it has an obvious advantage. The arrangement facilitates teamwork and the multidiscipline team approach is gaining acceptance in the attack on modern health problems. The team process is to some extent incompatible with a fixed control structure; it requires a minimizing of hierarchical relationships, with provision for naturally emerging leadership, and for shifting leadership. In one state health department the pyramidal organizational structure has been discarded. In its place a structure has been designed which emphasizes flexible team operations and intra-agency consultation.[24]

Interagency Relationships

Health services are provided by many official agencies and voluntary organizations and collaboration among them is necessary for orderly development and effective operation of health programs. Such collaboration must often include welfare and educational agencies. One frequently occurring component of interagency cooperation is the provision of consultative service by one agency to another.

Interagency competition and mistrust can make needed consultation impossible. Also, interagency trouble may arise simply from inadequate mutual understanding of agency goals, needs, and expectations. Klaes [15] describes a

neatly accomplished program of consultation to school nurses in which careful attention was given to clarification of the role, responsibility, and power of the health agency representative in the school system, and to the desires of school personnel.

A complicating feature in federal-state and state-local interagency consultation is that financial assistance is likely to be given in addition to consultation. Such financial assistance is accompanied by some control over what is done with the money. An administrative and a consultative relationship thus existing simultaneously can be productive of great confusion. The receiving agency may feel that it has to accept consultation in order to get the money, or the agency's dependence on the money may provoke a hostile response with rejection of consultative service. In this setting the influence of the money on consultation needs to be acknowledged and the administration of funds needs to be clearly distinguished from consultation.

A considerable interpenetration of supervisory and consultative activities occurs when certain functions or responsibilities are delegated by the state health agency to local health agencies, with the state retaining supervisory control. Neither consultant nor consultee may have a feeling of confidence about where control ends and freedom begins.

It is surprising to observe that in spite of severe complications in interagency relationships consultation often appears to operate with considerable effectiveness. What presumably happens is that personal maturity and professional dedication of the individuals surmount the organizational obscurities.

Summary

In summary, consultation is conceived as an interpersonal relationship in which giving and taking of help occurs and as having permissiveness as its outstanding feature. The emotional interaction between consultant and consultee is a prominent determinant of the effectiveness of the relationship, and reactions to the dependency and authority aspects of the relationship are especially characteristic of the emotional responses. The consultative process appears to have several elements, viz., request for assistance, development of rapport, diagnosis, working through, and termination.

Consultation in public health is influenced by the multiple roles of the health agency consultant, by problems in administrative integration of health agencies, and by the nature of interagency relationships. Personal maturity often makes consultation effective in settings of organizational obscurity.

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Jaycee 1956 Community Health Week

The Junior Chamber of Commerce has announced plans for its second annual community health week to be held March 15–24, 1956. "Lets Do More about Health" is the theme for 1956. Again, a Community Health Week Kit will be made available.

The National Health Council is cooperating with Jaycee in planning Community Health Week particularly in the direction of advising local health councils how they may be a part of the local planning for Community Health Week. A council committee for evaluating the 1955 program recommended continuance of the Commuity Health Week and continuing cooperation of the council. It found the program to be valuable experience for health groups in cooperative action, in developing lay leadership, and in gaining interest and support of the community in essential health services, both voluntary and official.

Local Jaycee chapters are expected to provide leadership. In communities, however, where there is no chapter a local cooperative health planning body may sponsor the program, in order that the weel: may be observed as widely as possible throughout the country.

Warren Taylor, manager, Safety Department, U. S. Junior Chamber of Commerce, heads up the program for Jaycees. The new kit and other information should be requested from him, 21st Main, Tulsa, Okla.

Estimation of Coliform Density by the Membrane Filter and the Fermentation Tube Methods

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That procedures in public health practice do not remain static or routine is suggested by this extensive research in the application of two different methods for measuring water contamination.

Statistical analyses of three extensive investigations comparing the membrane filter and fermentation tube technics for the quantitative estimation of coliform density [1-3] are summarized. The results indicate that for a wide variety of natural waters the estimates of coliform density obtained by using the MF technics employed in these investigations are, for practical purposes, in agreement with those obtained by the MPN method. The precision of the new method is two to five times greater than that of the standard procedure. It is undoubtedly true that the MF method may be improved through further developmental effort and that, at present, the two test procedures do not measure precisely the same groups of bacteria. However, the statistical analyses reported here point out certain deficiencies of the MPN method and present evidence that different standard confirmatory procedures have different coliform recovery efficiences and do not measure precisely the same groups of bacteria. In view of inherent limitations of the interpretative value of the coliform group as a whole, it is doubtful whether minor differences in the results obtained by two technics should weigh more heavily in the selection of standard methods than other relevant aspects of the tests, such as reproducibility, speed, convenience, and cost.

Method of Analysis

The laboratory examinations upon which these analyses are based were conducted with meticulous attention to detail by skilled bacteriologists. The precision of these density measurements is probably better than that commonly attained in routine water quality control and stream surveys. In addition to the published results [1-3] the authors have had access to original data from the Robert A. Taft Sanitary Engineering Center and the Millipore Filter Corporation.

The most extensive body of data analyzed pertains to a group of sampling stations near Boston (summarized in Table 1), for which the technics have been described by Yee, et al.[2] Re-

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Table 1—Coliform Densities in Streams and Ponds of Eastern Massachusetts

Station	Membrane Filter Tests							Fermentation Tube Tests							
	No. Replicate Filter	Vol. Sample per Filter ml	Mean Count per 100 ml	Mean Count per Filter	Std. dev. per Filter	Coef. of Variation	Lexis Ratio	No. Replicate Tests	Mean MPN/ 100 ml	Std. dev. MPN/ 100 ml	Coef. of Variation	$^{a}mpn/^{a}_{t}$	Relative Coliform Recovery MF/MPN	Relative Precision $^{a}mf/^{a}mpn$	Total Bacteria Mean Count/ 100 ml
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Concord R. (1)	25	10	44.4	4.4	2.42	0.54	1.15	10	89.6	71.1	0.79	1.29	0.50	0.34	6,670
Lincoln Pond	25	50	13.7	6.8	2.96	0.43	1.13	10	12.0	14.5	1.20	1.95	1.13	0.41	84
Wilmington Brk	25	25	29 3	7.3	2.95	0.40	1.09	10	64.2	34.5	0.54	0.88	0.46	0.34	712
Concord R. (2)	21	10	57.2	5.7	2.79	0.49	1.17	10	16.6	10.4	0.63	1.02	3.45	2.69	15,500
Charles R. (1)	100	1	1,139	11.4	3.45	0.30	1.02	5	2,320	1,050	0.45	0.73	0.49	0.33	..
Great Pond	25	100	11.6	11.6	6.07	0.52	1.78	10	5.6	4.4	0.78	1.27	2.06	1.38	552
Stony Brk (1)	25	100	13.0	13.0	4.68	0.36	1.30	10	14.0	6.8	0.48	0.78	0.93	0.69	5,470
Muddy R.	25	1	1,372	13.7	10.4	0.76	2.81	10	3,150	3,952	1.25	2.04	0.44	0.26	18,000
Assabet R.	23	1	1,456	14.6	9.04	0.62	2.37	10	617	525	0.85	1.38	2.36	1.72	22,700
Neponset R.	25	1	1,668	16.7	5.80	0.35	1.42	10	887	732	0.82	1.33	1.88	0.79	7,400
Fresh Pond	20	25	78.8	19.7	4.83	0.24	1.09	9	99	59.0	0.60	0.97	0.80	0.33	9,730
Sudbury R.	25	10	666	66.6	15.0	0.22	1.84	10	826	590	0.71	1.16	0.81	0.25	11,000
Stony Brk (2)	25	100	71.6	71.6	13.0	0.18	1.54	10	66.2	77.3	1.17	1.90	1.08	0.17	2,400
Merrimac R.	25	1	8,388	83.9	19.0	0.23	2.07	10	5,153	5,450	1.06	1.72	1.54	0.35	81,340
Charles R. (2)	25	1	9,808	98.1	13.8	0.14	1.40	10	9,890	7,420	0.75	1.22	0.99	0.19	112,300
Dracut Well	23	5	2,295	115	30.9	0.27	2.88	10	2,912	4,885	1.68	2.72	0.79	0.13	15,320
Charles R. (3)	40	1	14,160	142	26.1	0.18	2.19	5	15,580	10,130	0.65	1.06	0.91	0.26	..
Mystic R.	25	1	14,290	143	41.5	0.29	3.47	10	5,221	11,370	2.17	3.52	2.74	0.36	329,000
Median						0.32	1.48				0.78	1.27	0.96	0.34	

Col. 7 = col. 6 ÷ col. 5.

Col. 8 = col. 6 ÷ square root of col. 5. The Lexis ratio is the quotient: Sample standard deviation/square root of mean count per filter. It is a measure of "overdispersion" relative to a Poisson model.

Col. 12 = col. 11 ÷ col. 10.

Col. 13 = col. 12 ÷ 0.616. The sample standard deviation/theoretical standard deviation.

When 5 tubes in each of 3 or more decimal dilutions are used the theoretical coefficient of variation (*reference 4*):

$$\sqrt{\exp.\left(\frac{1.27}{5^{1/3}}\right)^{2} - 1} = 0.616.$$

The ratios of col. 13 reflect overdispersion relative to the theoretical distribution.
Col. 14 = col. 4 ÷ col. 10.
Col. 15 = [col. 6 × 100] ÷ [col. 11 × col. 3].

sults are given for 18 samples collected from 14 streams and ponds during the period January, 1953, to February, 1955. For each sample 20 or more replicate filters were prepared using modified Endo medium with oxine, 10 replicate fermentation tube tests yielding 10 MPN's were made on each sample. Each MPN was based upon five tubes in each of three or more decimal dilutions with confirmation on EMB agar. Fresh sterile pipettes were used for each dilution in each bank of five tubes to insure that the resulting precision would accord with that routinely attained with individual MPN's. In a few instances indeterminate MPN values occurred and the means and standard deviations were calculated by analysis with log-probability paper.[5] In all other samples the usual statistical computations were employed.

From Table 1 (columns 4, 10, and 16) it is evident that a broad spectrum of bacterial densities was measured. The relative coliform recovery of the two technics for the various samples, as expressed by the ratio of the mean MF to the mean MPN density (column 14), ranged from 0.50 to 3.45 with an over-all median of 0.96. In 10 of 18 samples the standard procedure gave higher results.

The total bacterial densities in Table 1 (column 16) were calculated from counts on membrane filters using a non-selective medium. With each sample a sufficient number of colonies was counted so that the reported mean density has a standard counting error of no more than 5 per cent.

Table 2 presents a summary of the principal results of the analyses of all three investigations. Essentially the same statistical methods were employed throughout and Table 2 is arranged to parallel Table 1. The Cincinnati study was designed and carried forward in a manner similar to that in Boston. However, the confirmatory medium used at the Sanitary Engineering Center[6] differed somewhat from that with which the data of Table 1 were obtained. Improvements in medium and technics used in the MF test were made subsequent to the survey summarized in Table 2; these have been described by Kabler.[7] In the interpretation of the relative MPN dispersions in the columns of Table 2 it is pertinent to note that the 10–10–10-tube test used in the Cincinnati investigation inherently

Table 2—Coliform Data—MPN vs. MF: Summary of Results of Three Comparative Investigations

Location	Description: Reference	Description: No. of Sampling Stations	No. of Samples	Results: Median for All Samples: MF Coefficient of Variation (7)	MF Lexis Ratio (8)	MPN Coefficient of Variation (12)	MPN $^{a}mpn/^{a}t$ (13)	Relative Coliform Recovery MF/MPN (14)	Relative Precision $^{a}mf/^{a}mpn$ (15)
Boston and vicinity	(2) and Table 1	14	18	0.32	1.48	0.78	1.27	0.96	0.34
Cincinnati and vicinity	(1)	12	18[a]	0.26	1.68	0.38[b]	0.90	0.71	0.54
Woods Hole, Massachusetts and vicinity	(3)	3	(i) 46	0.32	..	0.74[b]	1.20	0.77[c]	0.33
			(ii) 45	0.25	..	0.64[b]	1.04	0.52[c]	0.29
			(iii) 48	0.24	..	0.69[b]	1.12	1.00[c]	0.33

a. On most samples more than one quantity of water was filtered.

b. Computed in accordance with formula in footnote (col. 13) of Table 1. Ten tubes in each of 3 or more dilutions were used in the investigation at Cincinnati; five tube tests were used at Woods Hole and Boston.

c. Ninety-five per cent confidence limits for the population medians of relative recovery are: (i) 0.56 and 1.0; (ii) 0.42 and 0.64; and (iii) 0.69 and 1.10.

yields more reproducible MPN's than the 5–5–5–tube test used in the other studies.

The experimental design of the Woods Hole investigation [3] differed from that of the others. An extended time series of density measurements were made at three ocean water sampling stations. Fewer replicate filters were prepared with each sample than in the other studies and consequently the sampling errors of replicate measurements (Table 2, columns 7, 12, 13, and 15) cannot be regarded as being as firmly established as those of the other studies. However, these data have especial merit in that it is possible with many measurements at regular intervals at a given station to evaluate rather precisely the relative sensitivity of the MPN and MF technics (Table 2, column 14 and footnote c). The 95 per cent confidence limits for the population median recovery factor were computed by a nonparametric statistical method [8] and therefore are not predicated on arbitrary assumptions as to the precise mathematical frequency distribution function of the median densities. While the confidence zones are broad, they would appear to leave little doubt but that the densities obtained by the MPN method are generally somewhat larger than those obtained by the membrane filter technic. Woodward's analysis [1] corroborates this conclusion. While such differences may be statistically significant, it does not follow logically that the differences are of much practical import. In the following section are set forth various considerations relating to a practical evaluation of the observed coliform recoveries by the two methods.

Coliform Recovery

From Table 2 the over-all relative recovery factor, mean MF/ mean MPN, ranged from 0.52 to 1.00. At nearly all of the sampling stations the mean recovery factors fell in the range 0.3–3.00. This latter range corresponds approximately to the theoretical range into which 95 per cent of replicate 5–5–5–tube MPN's may be expected to fall. That is, if many replicate samples are tested from a water having a true mean density of 100 coliforms per 100 ml, 95 per cent of the resulting MPN's may be expected, according to the theoretical considerations of Halvorsen and Ziegler,[4] to fall in the range 30–300. The theoretical analysis, however, is predicated on an ideally random (Poisson) distribution of bacteria and does not take into account the effect of various experimental errors, such as imprecise pipetting and the action of predatory protozoa on coliform growth. There is some indication in the Boston and Woods Hole MPN data (Tables 1 and 2, column 13) that a small amount of "overdispersion" occurred * and that the theoretical 95 per cent confidence limits in practice might properly be regarded as really being 85 or 90 per cent confidence limits.

A large part of the differences in the MPN sensitivity and reproducibility between the Boston and Cincinnati data may undoubtedly be attributed to inherent differences in the standard confirmation technics employed—eosin-methylene blue plates (Boston); brilliant green bile tubes (Cincinnati). Examination of the MPN data in the Boston study indicated the occurrence of a disportionately high number of

* Similar overdispersion was noted in all investigations for the MF counts (Tables 1 and 2, column 8). The Lexis ratio (observed standard deviations divided by the Poissonian standard deviation) indicated that the dispersion of replicate counts actually attained was about 50 per cent larger than that expected from water having ideally distributed microorganisms and with hypothetical technics free from experimental sources of variance. It is noteworthy that the overdispersion observed was about the same as that reported by many workers for bacteria plate counts (Lexis ratios of 1.5–2.0).

low dilution (high concentration) tubes that failed to confirm and an excessive number of "skips" corresponding to improbable MPN's resulted. In flagrant instances of this occurrence the low dilution results were ignored in the computation of the MPN's so that the disparity between the EMB and BGB technics reported is not as great as otherwise would have been the case. With some of the Boston samples both EMB and BGB confirmation were carried out in parallel. The latter were found rather consistently to yield larger MPN values. From a statistical viewpoint it appears that the two standard confirmatory procedures do not measure precisely the same groups of bacteria.

A further point in this connection is relevant. While the median ratios of densities by the two methods indicate that MF counts on the average are undoubtedly smaller than corresponding MPN's, a sizable portion of the difference may be attributed simply to the fact that the most probable number, mathematically considered, is a biased estimator of the true density. The arithmetic means of replicate MPN's tend to be too high by a factor of 23 per cent in a 5–5–5–tube test and a factor of 43 per cent in a 3–3–3–tube test. If a large number of replicate 5–5–5–tube MPN tests are made from water containing 100 coliform per 100 ml the arithmetic mean MPN will be 123 instead of 100. If the method suggested [5] for correcting for the bias of the MPN test had been used in the statistical analysis of Tables 1 and 2, the reported recovery factors (column 14) would have been more closely centered around unity. In this respect, therefore, the disparity in coliform recovery between the two technics is more apparent than real.

In Figure 1 is shown a scatter-diagram of the Woods Hole density measurements by the two methods. In this plot the MF values are plotted against the MPN values with correction for bias. The correction factor (0.81 = 1/1.23) pertains to the 5–5–5–tube test used in the investigation. With this adjustment for bias the plotted points exhibit an average recovery factor of approximately 100 per cent.

As a matter of interest confidence zones of 50 per cent, 75 per cent, 95 per cent based on the Halvorsen-Ziegler theory for the dispersion of replicate MPN's have been constructed on Figure 1. These zones are applicable (neglecting overdispersion) to points obtained from pairs of replicate 5–5–5–tube MPN's. Thus on a scatter diagram of duplicate MPN values, 95 per cent of

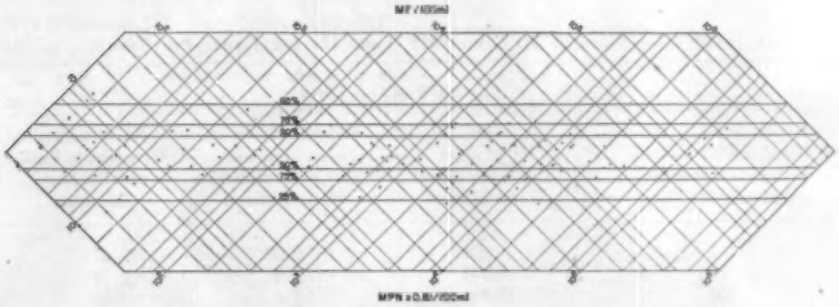

Figure 1—Log-Log Plot of Coliform Densities by the MF and MPN Methods, Woods Hole Series (Presnell, Arcisz, and Kelly [2])

the points may be expected to fall between the parallel lines delimiting the 95 per cent confidence zone. In Figure 1 in which MF is plotted against MPN, 132 of the 139 points (94.97 per cent) fall within the 95 per cent confidence zone. The implication is that for the Woods Hole samples the correlation between MPN and MF is about the same as that which would be obtained between duplicate MPN values.

The foregoing discussion may be summarized in the following statement: The disparity in the coliform sensitivities of the MF and MPN in a wide variety of natural waters does not have much practical significance in view of the inherently low degree of reproducibility of the standard dilution test and the bias of MPN estimates and in view of comparable differences in sensitivities existing between permissible alternate procedures of the latter.

Comparison of Precision

In assessing the precision of the two methods the following points are relevant: (1) The precision of a MPN value obtained from a multidilution fermentation tube test depends chiefly upon the number of tubes observed in each dilution and not upon the bacterial density.[4] The standard error of sampling may be made very small if a large number of replicate tubes are tested. (2) The precision of a MF value from a single filter depends primarily upon the number of sheen colonies counted. Hence, the reproducibility of a MF value depends on the product of the bacterial density and the volume of sample filtered. (3) The standard error of a mean density obtained from replicate tests depends upon the foregoing factors and in addition varies inversely with the square root of the number of replicates. The standard deviations tested in Table 1 pertain to individual measurements and depend only upon factors (1) and (2).

From Table 1, column 15, it may be seen that the precision of the MF test was superior in all but three of the samples tested. From Table 2, column 15, the median ratio of the standard deviation of the individual MF test to that of the MPN for 5–5–5–tube test is seen to be about one-third, and for the 10–10–10–tube test about one-half.

In assessing the practical aspects of the relative reproducibility, the results (Table 3) of a comparative computation may be helpful. Formulating the frequency dispersion of replicate of 5–5–5–tube MPN's by the log normal distribution [4, 5] and that of replicate MF's by the negative binomial distribution [9] with a constant Lexis ratio of 1.65, estimates have been made of the

Table 3—Sizes of MPN and MF Tests Having Equal Precision

	MF Test One Filter		MPN *
Number of Colonies Counted on Individual Membrane Filter	No. of ml of 1 Coliform/100 ml Water Filtered	No. of ml of 5,000 Coliform/100 ml Water Filtered	No. of Tubes Required in Each of 3 Decimal Dilutions
1	100	0.02	2
10	1,000	0.2	9
100	10,000	2.0	69

* One multidilution tube test yielding a single determinate MPN. In the case of potable waters this requires the use of 100 ml fermentation tubes.

number of tubes needed in multidilution MPN tests to provide a precision equal to MF tests involving various numbers of counted sheen colonies.

From Table 3 it is evident that with waters of high coliform density the advantage of the MF technic is especially marked. With densities in the potable water range the advantage is not as great unless larger volumes of water are filtered. However, such waters usually will fiter rapidly and precise counts may readily be obtained. With the assumptions underlying the calculations summarized in Table 3 it may be shown that 42 ml of water just complying with the drinking water standard of 1 coliform per 100 milliliter must be filtered so that the resulting MF count will yield a precision equal to that obtained with the usual single-dilution test of five 10 ml tubes.

Conclusions

Results of statistical analyses of three extensive investigations on a wide variety of natural waters comparing the MPN and MF technics indicate that, on the average, the former gave higher indications of density by a factor 1.0–1.9 with an average of 1.3 for the specific technics used in these investigations. However, the difference is not regarded as important from a practical viewpoint because of the inherent lack of precision of the individual MPN value. Moreover, the disparity between MF and MPN values for most of the water samples tested was not significantly larger than discrepancies between results obtained with permissible variations of the standard dilution method. A considerable part of the disparity between the MF and MPN values may be attributed to the fact that mathematically considered, the MPN tends to overestimate the true density; on the average MPN values are greater than the true density.

With nearly all of the samples listed the precision attained with a single filter was found to be two to five times greater than that of a 5–5–5–tube MPN. The reproducibility of the MF test as measured by the coefficient of variation of replicate tests was found to vary inversely with the square root of the number of colonies counted.

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Demonstration of Infectious Agents in Sewage

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Three investigations demonstrate the effectiveness of the swab as a device for finding infectious agents that may occur intermittently in sewage and remind us that "acceptable" sewage treatment facilities do not always destroy pathogenic agents.

The technic devised by Moore [1] for collecting sewage specimens to be examined for infectious agents, together with isolation methods developed within the last two decades, has placed a valuable tool in the hands of microbiologists, sanitarians, and epidemiologists. In the work reported here this procedure was used for sampling in efforts to demonstrate three types of infectious agents in sewage: Coxsackie viruses in connection with water pollution studies to evaluate present indexes of pollution; tubercle bacilli, to determine the effect of sewage treatment on survival; typhoid bacilli, in a cooperative study with the Bureau of Epidemiology and Communicable Disease Control of the New York State Department of Health to locate a typhoid carrier.

Moore's method of sampling, used successfully in England to locate sources of paratyphoid infection,[1] typhoid carriers,[2] and centers of poliomyelitis virus spread,[3] consists of exposing pads of gauze (swabs) to sewage and using the liquid expressed from the swab as the sewage sample. This differs from the traditional type of sewage sample, the catch sample, which is dipped from the source in an instant and is representative of the sewage only at that instant. The expressed liquid from the swab, on the other hand, is a composite of the sewage which flows through the swab during the exposure period.

In general, the technical details of his sampling procedure were followed: Each swab was made by folding a strip of gauze 6×48 inches into a square pad and fastening a length of stout string to one corner. They were sterilized by autoclaving in paper bags, in which they were stored. During the exposure periods, the swabs were immersed in flowing sewage at sewage treatment plants in below manholes and were held in place by tying the strings to manhole covers or other convenient objects. While the same technic was used for sampling sewage for each infectious agent sought, the sewage sources and subsequent isolation procedures differed for each agent.

Viruses

In connection with improving methods for detecting viruses in sewage and water supplies, the value of swab sampling over that of catch sampling was ascertained. As reported previously,[4] swab samples of sewage taken from treatment plants in the Albany area frequently yielded Coxsackie viruses; whereas catch samples obtained at the beginning or end of the exposure period (48 hours) did not. This finding is consistent (Table 1) and has been ob-

Table 1—Coxsackie Virus Recovery From Catch and Swab Samples—Catch Samples Taken During Swab Sampling Intervals

	Number			
	1952		1953	
Sample	Total	Positive	Total	Positive
Catch	4	0	4	1
Swab	4	3	4	4

served also by Melnick.[5] The expressed liquid (60–100 ml) from the swabs (and catch samples) was reduced to a small volume by adsorption on Dowex 1 ion-exchange resin and elution from it with 2–3 ml of beef extract broth.[4] That this step increased the frequency of virus demonstration in sewage samples is clear from Table 2. The eluates to which streptomycin and penicillin were added were injected into 16 zero to two-day-old mice within 24 hours or following several weeks' storage in a dry ice chest.

In LoGrippo's description of the application of ion-exchange resins to virus purification,[6] 10 per cent phosphate is recommended as an eluant, followed by dialysis prior to animal injection. In comparative tests, beef-extract broth[7a] was found to elute the viruses as effectively as phosphate. This preparation does not require dialysis, since it is not toxic upon injection into mice. No doubt other solutions containing exchangeable ions would also be useful eluants.

Table 2—Coxsackie Virus Recovery in Untreated (U) and Resin-Treated (R) Sewage Samples

Virus Detection in Sample		Number of Samples
U	R	
0	0	7
0	+	7
+	++	11
+	+	3

Mice that became paralyzed or spastic during the 14-day observation period following injection were presumed infected with Coxsackie viruses; isolations were confirmed by further passages in suckling mice and failure of passage in adult mice and in many cases by serologic characterization.

With consistent use of these two new technics, sampling by the swab method, followed by sample treatment with ion-exchange resins, the normal distribution of Coxsackie viruses in raw sewage throughout the year was determined. Swabs were exposed to the influent of the following sewage treatment plants in the area for 48-hour periods, the Albany plant receiving chiefly domestic sewage at a flow rate of 30 mgd from a population of approximately 130,000, and the Colonie (Albany-Schenectady Road) plant receiving domestic sewage at a flow rate of 0.4 mgd from a population of approximately 3,000. They were transported to the laboratory in pint Mason jars and if not processed immediately, as described above, they were stored in a dry ice chest (— 45°C to — 65° C) for several weeks. Frequently, the expressed liquids from the swabs were frozen before resin treatment, in which case they were frozen in an electric deep freezer before transfer to a dry ice chest; this prefreezing reduced container breakage during storage. Sewage was sampled weekly

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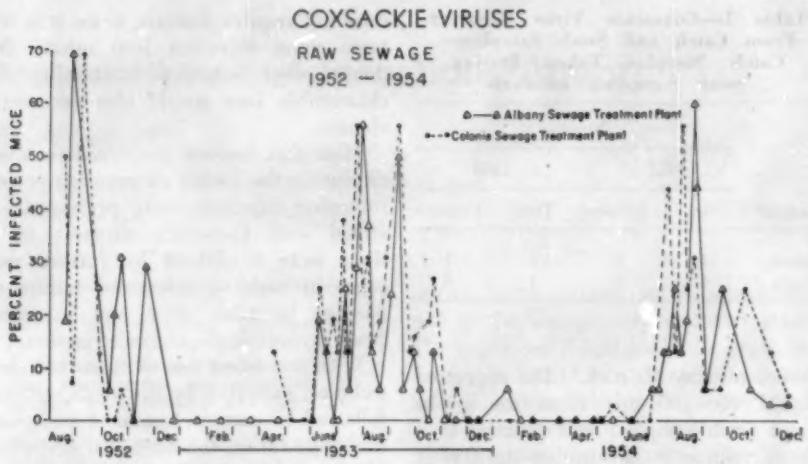

Figure 1—Coxsackie Virus Occurrence in Raw Sewage Throughout the Year

in months when high virus frequencies were anticipated [4] and biweekly or monthly in intervening periods.

Coxsackie viruses occur seasonally in sewage of the Albany area, being present continuously between June and November and only sporadically during the remainder of the year (Figure 1). This seasonal distribution of the viruses, indicated by a preliminary study,[4] has been reported since for other communities [8] and was found in earlier searches for poliomyelitis virus in Canada [9] and New York City.[10]

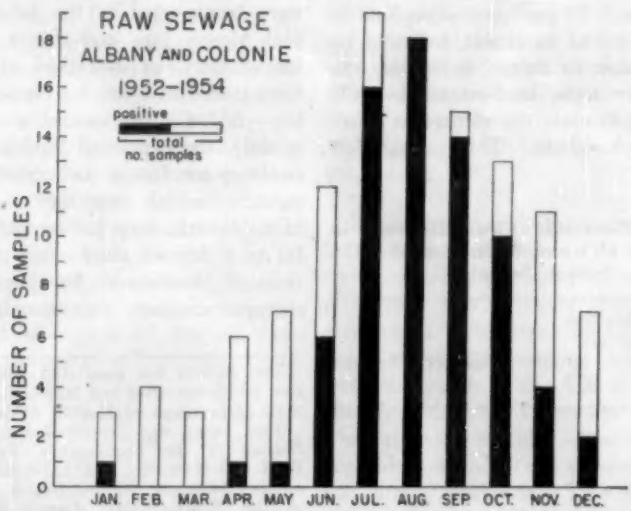

Figure 2—Coxsackie Virus Frequency in Sewage Throughout the Year

Quantitation of the amount of virus present was estimated by per cent of infected mice per sample. In the estimation, nonspecific deaths of mice were omitted from the tabulations. The quantitation shows that the viruses are present in greatest amount from late July to early September (Figure 1). Their frequency is highest in August (Figure 2). The fluctuations in amount found, within a short interval, may be owing to: (1) errors in sampling and subsequent treatment; (2) susceptibility differences in mice; and (3) actual fluctuations in the amount of virus in sewage even in the peak season. The rare appearance of these viruses out of season suggests they may be present in sewage continuously in small amounts and are undetectable only because of limitations in sampling and isolation procedures.

The amount of virus was found to fluctuate during the daily flow by testing the liquid from swabs exposed for one-hour periods in the morning and in the afternoon. Viruses were detected, for example, in sewage flowing through the plant in the morning but not in the afternoon. This finding coincides, perhaps, with the flow rate of domestic sewage which is greater in the morning.

Sewage treatment does not necessarily destroy the Coxsackie viruses. Sedimentation in an Imhoff tank having a retention period of two hours, as carried out at the Albany treatment plant, had no destructive action on virus. During the summer and fall viruses were recovered regularly from the effluent as well as from the influent of the plant. Secondary treatment on a trickling filter, followed by simultaneous sedimentation and chlorination, as practiced at the Colonie plant, was not always effective (Table 3). This plant suffers from overloading and frequent mechanical difficulties and as a result the residual chlorine often is zero.

Three other plants in the area were sampled several times during the summer months to determine the effect of sewage treatment on the viruses. Swab samples of raw sewage and plant effluent were taken from the following plants: Delmar, treating sewage from a population of approximately 9,000 by sedimentation in an Imhoff tank at a designed flow rate of 0.8 mgd; Schenectady, treating sewage from a population of approximately 92,000 by primary sedimentation at a designed flow rate of 16 mgd; Scotia, treating sewage from a population of approximately 7,800 by primary sedimentation at a designed flow rate of 1.2 mgd. In none of these plants did sewage treatment destroy these viruses (Table 3). This failure of certain phases of sewage

Table 3—Coxsackie Virus Recovery From Various Stages of Sewage Treatment

Collection Period 1954	Plant	Number of Samples					
		Influent		Filter Effluent		Effluent	
		Total	Positive	Total	Positive	Total	Positive
Jan.–Dec.	Albany	20	10			20	10
Jan.–Nov.	Colonie	13	7	4	2	12	1
July–Sept.	Delmar	5	3			5	5
July–Sept.	Schenectady	5	4			5	4
July–Sept.	Scotia	4	4			4	3

treatment to destroy viruses was encountered also by Gear [11] studying poliomyelitis virus presence in sewage.

Tubercle Bacilli

To determine whether present methods of sewage treatment are adequate to destroy tubercle bacilli that are discharged from tuberculosis hospitals, demonstration of the bacilli was attempted in sewage from several sewage treatment plants receiving wastes from large tuberculosis hospitals in New York State. Isolations from receiving streams were also attempted since they may constitute a source of infection. Sewage was sampled by catch and swab methods, and isolation technics developed chiefly with samples received from the Saranac Lake and Ray Brook sewage treatment plants. Sewage from two other plants, Oneonta and Perrysburg, was then examined for the bacilli by the procedures developed.

Sewage specimens were transported by parcel post, railway express, or messenger, usually arriving at the laboratory within 48 hours of collection. When swab sampling was carried out the swabs were immersed in sewage for 24 or 48 hours and were transported in pint Mason jars. Twenty-four-hour swab sampling came to be the practice since 48-hour specimens induced more intercurrent infection in inoculated animals. All sewage specimens were refrigerated upon being received at the laboratory and were usually processed within two days after arrival.

Isolation of the bacilli by cultural examination was unsatisfactory because of overgrowth with spore-forming bacilli and the presence of large numbers of saprophytic acid-fast rods, some of which resembled tubercle bacilli in their cultural characteristics. Demonstration by guinea pig inoculation gave much more satisfactory results and was used as the sole test in most of the examinations.

At the Saranac Lake sewage treatment plant gallon-catch samples were collected from the Saranac River at the plant outfall and at various distances down the river. One swab sample was taken at the outfall. This plant treats sewage from a population of approximately 6,900 by primary treatment at a designed flow rate of 1.8 mgd and discharges its effluent into the Saranac River, used at present for fishing and bathing.

Of 56 guinea pigs injected with catch samples from the outfall, 29 showed evidence of tuberculosis at autopsy. Of five injected with a sample collected 100 feet downstream, all had evidence of tuberculous infection. Samples collected approximately one-half mile and one mile downstream had no demonstrable tubercle bacilli. All the animals injected with liquid from the single sewage swab died of intercurrent infection, as did a number injected with the catch samples.

These initial sewage examinations indicated: (1) tubercle bacilli can be demonstrated in sewage more readily by animal tests than by cultural examination; (2) sampling by the catch method may be inadequate; (3) treatment of catch samples by centrifugation is laborious and time-consuming; (4) if swab sampling is used the liquid expressed requires further treatment before animal injection; (5) primary sewage treatment does not destroy tubercle bacilli; and (6) the bacilli may be present in streams receiving effluents from such plants. To improve methods and obtain further information about tubercle bacillus survival, sampling was extended to a secondary treatment plant at the Ray Brook Tuberculosis Hospital receiving wastes from a population of approximately 500 at a designed flow rate of 0.09

mgd. Secondary treatment facilities at this plant consist of a trickling filter, secondary clarifier, and chlorinator. Both catch and swab samples of clarified effluent before and following chlorination were examined for the bacilli. Tubercle bacilli were isolated from 18 of 35 guinea pigs inoculated with samples collected before chlorination, and in seven of 35 inoculated with specimens collected following chlorination. During the sampling period in this plant, there was a dosage of eight pounds of chlorine per day with an estimated contact time of 10 minutes and no residual chlorine. This degree of chlorine treatment decreased the number of tubercle bacilli demonstrable but by no means inhibited them completely.

Prior to animal inoculation, swab samples were treated as follows: They were suspended in 4 per cent NaOH, shaken in a machine, and centrifuged. This produced a bulky sediment which was neutralized with phosphate buffer to pH 6.6. Guinea pigs were inoculated with the sediment, but the presence of a large number of spore-forming bacilli caused a high mortality even when 200 units of penicillin per milliliter of inoculum were added. Heating the specimen to about 37° C for an hour while in contact with the NaOH, a procedure used to digest sputum specimens in routine examination for tubercle bacilli, decreased this mortality rate, and increased the percentage of animals showing evidence of tuberculosis. Because the volume of the sediment was large, only a portion was used for inoculum. As a means of separation of the tubercle bacilli from spore-forming bacilli, lactose to give 10 per cent by weight was added when the sediment was neutralized, and the mixture was then shaken.* On further centrifuging, the suspended solids and spore-forming bacteria were sedimented while the tubercle bacilli were found in the top layer, a portion of which was used for guinea pig inoculation. This lactose-treated fraction was less bulky to handle than was the heat-treated specimen and was used therefore in later examinations.

The gallon catch samples were concentrated by one of the following methods: (1) flocculation with such reagents as zinc acetate, aluminum sulfate, tannic acid, or ferric sulfate, (2) centrifugation at 2,400–2,800 rpm, or (3) filtration of a 100–200 ml aliquot on a "coli 5" membrane filter. Catch samples concentrated by flocculation and by membrane filtration, when inoculated into guinea pigs, gave higher mortalities and less evidence of tuberculous infection than did the heat-treated or lactose-treated swab samples (Table 4). Catch samples concentrated by centrifugation gave evidence of tuberculous infection comparable to that given by the treated swabs; the ease and safety with which the swabs were collected and handled, however, were decidedly in their favor for routine use.

Using centrifuged catch samples and lactose-treated swab samples, further studies were made of the survival of tubercle bacilli in sewage of the Oneonta treatment plant into which wastes from the Homer Folks Tuberculosis Hospital are discharged. This plant receives sewage from a population of 13,500 at a designed flow rate of 3.0 mgd and treats it by primary sedimentation. Twenty-seven guinea pigs were inoculated with specimens of raw sewage from the hospital, primary settling tank influent of the treatment plant, and tank effluent. As indicated in Table 5 sedimentation had little

* The addition of lactose to increase the density of the suspending medium is a procedure followed in the preparation of blood fractions by differential centrifugation in the University Laboratory of Physical Chemistry Related to Medicine and Public Health, Harvard University.

Table 4—Comparison of Sample Treatments for Demonstration of Tubercle Bacillus in Sewage

Treatment	Number of Guinea Pigs Inoculated					
	Catch			Swab		
	Total	Positive	Per cent Positive	Total	Positive	Per cent Positive
Centrifugation	96	56	58			
Flocculation (ferric sulfate)	34	6	18			
Filtration	20	3	15			
None				73	21	29
Heat	34	16	47	8	4	50
Density change (lactose)				35	16	46

destructive action on the bacilli. Dilution of sewage by the town's population probably accounts for the difference in tubercle bacillus recovery in the hospital sewage and the tank influent.

A year later, at the secondary sewage treatment plant of the J. N. Adam Tuberculosis Hospital in Perrysburg, additional examinations for tubercle bacilli were made. This plant receives sewage from a hospital population of about 500 at a designed flow rate of 0.18 mgd, treats it by sedimentation, filtration on a trickling filter, and secondary clarification followed by chlorination and discharges the effluent into a tributary of Cattaraugus Creek, used at present for fishing. Twelve guinea pigs each were inoculated with specimens collected from various stages of sewage treatment. As shown in Table 5 secondary treatment was apparently effective in destroying the bacilli. Of 36 animals injected with catch samples, collected at various distances downstream from the outfall, one, however, showed evidence of tuberculosis. This positive sample was collected 1,000 feet from the outfall; while those collected 100 and 500 feet

Table 5—Tubercle Bacillus Demonstration in Various Stages of Sewage Treatment

Stage of Treatment	Number of Guinea Pigs Inoculated (Tuberculous/Total)		
	Homer Folks Hospital, Oneonta		J. N. Adam Hospital, Perrysburg
	1953	1954	1954
Hospital sewage	18/27	14/16	
Primary tank influent	7/27		7/12
Primary tank effluent	5/27		1/12
Secondary clarifier influent			3/12
Secondary clarifier effluent			0/12
Plant effluent			0/12

downstream on four occasions failed to produce tuberculosis. This discrepancy suggests that catch sampling is inadequate, since it reflects only a momentary state of the stream or sewage. It also indicates that failure to recover the pathogenic agent may mean, not that it is necessarily absent, but that the efficiency of the sampling and demonstration methods is the limiting factor in successful isolation.

The observation that four of the infected animals inoculated with sewage from the Perrysburg plant had lesions of the type induced by isoniazid-resistant strains led to speculation about the effect of the current widespread use of antibiotics on tubercle bacilli survival in sewage. As the use of isoniazid had greatly increased since specimens were first collected from the Homer Folks Hospital, an additional series of specimens were collected from that hospital and tubercle bacilli were found to be abundant. This indicates that the use of antibiotics has little, if any, influence on the recovery of the bacilli from sewage.

In the course of shipment of sewage specimens from the Homer Folks Hospital to the laboratory, one set was delayed in transit by railway express for eight days. Ample evidence of tuberculous infection was noted in guinea pigs inoculated with the set of specimens, suggesting that survival in sewage is not transitory.

Salmonella

Five cases of typhoid fever occurred in three successive years in three families which lived within a mile of each other along a creek into which the effluent of the sewage treatment plant of a western New York village is discharged. The first case was a child who admitted drinking water from the stream below the outfall. The other patients lived below the outfall. The families did not know or mingle with each other.* The typhoid bacilli isolated from specimens from all the patients were phage Type D_4.

Gauze swabs were immersed in the influent and effluent of the secondary sewage treatment plant and in the sewers of the village at points selected to provide information on the occurrence of typhoid bacilli in sewage from specific streets or from lateral sewers. Following four days' immersion, each swab was placed in 200 ml buffered 30 per cent glycerol solution [7b] and was received at the laboratory within 24 hours after collection. The suspension was diluted 1:10 and 1:100 with buffered 30 per cent glycerol solution. The undiluted suspension and the two dilutions were streaked on bismuth sulfite agar [7c] and a modification of Endo's agar.[7d] One and 5 ml amounts of the undiluted suspension were added also to 12 ml and 50 ml, respectively, of tetrathionate medium [7e] and incubated for 18–20 hours at 35° C–37° C. The latter was then streaked on bismuth sulfite agar plates, which were examined after incubation at 35° C–37° C for 18–20 hours and again after 40–48 hours.

Salmonella typhosa, phage Type D_4, was isolated from 10 of 29 specimens collected, including one from the sewage drainpipe of a nursing home, but not above this point in the sewer system. The search for the carrier was therefore focused on this home and a carrier of S. typhosa, phage Type D_4, was discovered there.

It is of interest that S. montevideo was isolated from five specimens collected from the influent and effluent of the sewage treatment plant, but no attempt was made to determine the source of this microorganism.

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* The epidemiologic data were furnished by Dr. Robert M. Albrecht, acting director of the Bureau of Epidemiology and Communicable Disease Control.

In six instances S. typhosa was found on plates streaked with one or both dilutions of the original suspension, but not on those inoculated with the undiluted material, while the reverse was true in only two. Twice it was found only on plates streaked with the 1:10 dilution, once only on those from the 1:100 dilution, and three times on those from both. It was never found on plates inoculated with tetrathionate medium. On the other hand, S. montevideo was found only on plates inoculated with tetrathionate medium.

In addition to illustrating the practicability of locating a typhoid carrier, the observations described here indicate that sewage treatment may not destroy Salmonella.

Discussion and Summary

The results of these three investigations illustrate the suitability of the swab as a sampling device, and in combination with appropriate isolation technics, demonstrate the practicability of isolating infectious agents which may occur intermittently in sewage. The ease and safety with which the swab may be handled by the collector and laboratory technicians are additional factors that cannot be ignored. As suggested by the British workers, these procedures offer a practical approach to the heretofore frustrating problem of searching for Salmonella carriers among groups of food handlers.

More accurate information about the presence of infectious agents in sewage should now be obtainable, during periods when outbreaks or epidemics are nonexistent, as well as when they are recognized. The three studies offer ample evidence also of the disturbing fact that sewage treatment, while complying with existing standards, may not control pathogenic agents to the extent that receiving streams can be ignored as potential sources of infection.

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Radiological Health—An Over-All View

S. ALLAN LOUGH, Ph.D.

Some of the public health hazards, and the problems arising from them, that will stem from the rapidly increasing scientific and industrial applications of ionizing radiation are identified and discussed in this provocative review.

Our knowledge of ionizing radiations has been accumulated in the brief 60 years since 1895 when Roentgen discovered x-rays. Marie and Pierre Curie followed soon, in 1898, with the discovery of radium, and Rutherford discovered the alpha particle in 1904. Extensive investigation followed these initial discoveries. In 1919 Rutherford transmuted nitrogen to oxygen of mass 17 by alpha bombardment, but the year 1932 brought the announcement of many fundamental developments which have implemented the attainment of our present knowledge. In 1932 Lawrence described the cyclotron; Cockcroft and Walton transmuted lithium by proton bombardment; Urey, Brickwedde, and Murphy discovered heavy hydrogen, or deuterium; the Van de Graff accelerator was produced; Chadwick discovered the neutron; and Anderson discovered the positron. Curie and Joliot discovered artificial radioactivity in 1934. In 1932 there were no artificial radioactive elements. In 1934 there were three; by 1937 there were 190; and in 1941, before the advent of nuclear reactors, 370 artificial radioactive isotopes had been identified. The discovery of uranium fission by Hahn and Strassman in 1938 paved the way for the development of the atomic pile, or nuclear reactor, and for the production of relatively tremendous quantities of numerous radioisotopes by neutron bombardment of stable nuclei.

Progress was extremely rapid immediately after December 2, 1942, when Fermi initiated the first chain reaction from nuclear fission. The pressure to develop nuclear weapons resulted in the expenditure of large sums of money, a portion of which was devoted to methods of making by-product materials, or radioisotopes. The first shipment of a pile-produced radioisotope was made in August, 1946, and because these substances were produced as by-products of the weapons program it was possible for the U. S. Atomic Energy Commission to keep their price relatively low, thus stimulating their widespread use. Since then many thousands of curies of radioactive materials have gone out in many thousands of shipments to a very varied group of users over the United States and in many foreign countries.

When one reflects upon the public health problem posed today by the use of machines and radioisotopes as sources of ionizing radiation one cannot avoid the feeling that it is large. Even more important is the increasing magnitude of the problem. Before we discuss its characteristics it will be helpful to review some of the effects of ionizing radiation.

Biological Effects of Ionizing Radiation

This is not the place for a detailed discussion of the ways in which ionizing radiation produces changes when absorbed in matter, so let us content ourselves with a broad picture of the

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phenomenon. X-rays, alpha and beta particles, protons, neutrons, and gamma rays are all absorbed in varying degree by materials upon which they impinge. Whether the radiation arises from outside the body, or from inside, as is the case when radioisotopes have been internally administered, the phenomenon is essentially the same, namely, electrically neutral molecules are converted into ions which exhibit different properties and are not able to support the normal metabolic functions for which they were designed.

For a given amount of energy absorbed, alpha particles, fast neutrons and protons produce more injury than x-rays, gamma rays, or electrons and are said to exhibit a higher relative biologic effectiveness. Another variable in the protection problem is the difference in radiosensitivity of various body cells, tissues, and organs. Young, rapidly dividing cells are the most sensitive, and fully differentiated nerve cells are the most resistant to radiation. The rate at which the radiation dose is administered is important also. For example, it might require a dose one and one-half times greater to produce a fatal effect from a long drawn-out, fractionated exposure than would be required in a short exposure. Tissues moderately injured initially can usually recover, at least to a degree, if further radiation is avoided.

Even a small dose of radiation probably produces an injurious effect, but doses below some limiting value may not produce an effect which can be detected even over the entire life of the individual. In any case, if one is to work with radiation, one may be forced to accept some low dose of radiation in order to perform one's task. These considerations plus the experience over many years have led to the concept of the "maximum permissible dose," which currently is set at 0.3 roentgen per week. Radiation workers should strive to keep the dose at least this low in any one week, for by so doing they can take advantage of the capacity of tissues to recover from slight radiation injury.

Scientific, Medical, and Industrial Uses of Radiation

The above remarks may have raised some questions in one's mind. Is ionizing radiation used widely enough in our present society to create a serious public health problem? Granted that those persons who work with devices or materials which emit radiation may be exposed to measurable hazards, but are enough people involved that we should be alarmed or more than passively concerned? In my opinion there is clearly no cause for alarm, but there is justification for an exhibition of concern by those agencies which bear responsibility for the public health. Let us review some of the ways in which radiation is being used in an effort to outline the scope of the situation.

In all fields of science, in universities, research institutes, industrial and government laboratories, radiation from one source or another, in small or large amounts, is being used as a valuable tool in the search for new information. X-ray machines and particle accelerators, such as the cyclotron, the betatron, and linear accelerators, are used to study the effects of ionizing radiation on materials or systems under examination. These very energetic devices can be installed under conditions which insure adequate protection to technical personnel and to those whose work may obligate them to be in the neighborhood. Construction of suitable protection adds materially to the cost of installation and sometimes hampers experimental procedures; under these conditions there is always the temptation to disregard to some degree the protective aspect.

Since the Atomic Energy Commission's program of isotope distribution began, radioisotopes have become plentiful and relatively cheap and their use has grown apace. About 100 different radioisotopes are available from the commission. One or more of these is in use in at least a thousand laboratories over the country. Chemists, physicists, biologists, animal and plant physiologists, metallurgists, bacteriologists, entomologists, students of atmosphere, those interested in deposition of silt above dams—all these and others—are among those who currently employ radioisotopes in their investigations. The radiological hazard varies with the project, with the radioisotope, and with the amount used. Sometimes the chief risk comes from the chance of an unwholesome dose of external radiation, at other times from the possibility of ingestion and receipt of an internal dose, or perhaps from the probability of loss of the material with the consequent danger to persons who may pick up the radioactivity unknowingly. It is only fair to say, however, that the overwhelming majority of research workers who employ radiation devices or radioisotopes are cognizant of the problems and make a sincere and adequate effort to provide suitable protection.

In medicine, as we all know, x-rays are extensively used. While the earlier installations in hospitals and doctors' offices were frequently inadequately protected, the situation now is much improved. Radiologists are a specially trained group who are, in the main, thoroughly aware of the need for caution and of the means of maintaining safe conditions. Economics enters into this picture also. The cost of satisfactory protection in a diagnostic x-ray installation is moderate, but greater sums are called for when a therapeutic machine is involved. Experience has shown that unsound conditions are more frequently encountered in machines used for fluoroscopic purposes. It must be remembered also that any physician who is licensed to practice medicine is able to buy and use an x-ray machine, even though he may not have special training in the technics required. In some localities rather successful efforts have been made by enforcement agencies to insure adequate protection in medical x-ray installations, but it is probable that much remains to be done.

Radium, in tubes or needles for interstitial implantation, can be bought on the open market. Its cost is high enough to make loss a minor problem, but storage is another matter. It is probably safe to say that much of the radium in medical use is stored under insufficient shielding. This situation could and should be corrected when found. In use, doctors, nurses, and technicians are sometimes careless in the way they handle radium needles. The implantation of needles is frequently difficult to accomplish without delivery of some radiation to the operator, but a study of procedures and exercise of additional ingenuity could probably improve the picture. Here, education and training are needed, first, to point out the problem, and second, to acquaint operators with suitable technics. Some radium handlers seem to ignore the problem.

Since 1950 large sources of Cobalt 60 have been available for use in the gamma ray therapy of conditions for which high-energy x-ray machines have been employed. It is probable that Cesium 137 will be placed in some units also. These devices deliver energy which corresponds to that derived from one and two million volt x-ray machines and the protection problems are considerable. Fortunately, procurement of one of these radioactive sources is under the control of the Atomic Energy Commission and before

an authorization is issued for such procurement, the prospective user is required to describe in detail all features of the installation. These features must provide for suitable protection. This assurance of safety before the device is obtained and put in operation is all the more important because some physicians desire to install the source of gamma radiation in offices located in apartment houses or other dwellings.

Beta ray applicators, containing Strontium 90, are used for the treatment of superficial eye and skin lesions. In this device the radioactive material is sealed in a container, one wall of which is a thin foil. If a leak develops Strontium 90 will creep out and deposit on the outside of the container, thus offering some opportunity for ingestion of the material. Since the maximum permissible body burden of Strontium 90 is only one microcurie, it is important that these applicators be checked for external contamination at six-month intervals.

Radioisotopes, internally administered, are employed in both diagnostic and therapeutic procedures. Chief among these are Iodine 131 in thyroid disease, in determination of blood volume, and in the localization of brain tumors; Phosphorus 32 in polycythemia vera and to a limited extent in tumor localization; Sodium 24 in delineating impaired circulation to a part; Gold 198 in the treatment of prostatic carcinoma and of persistent ascites and pleural effusion associated with the presence of metastasized malignancies. Occasionally some precautions are called for in handling excreta, but usually this presents no problem. Receipt of shipments and preparation and administration of doses require proper technic to avoid undue radiation exposure to operating personnel. Some degree of segregation is indicated for patients who have received large therapeutic doses, and nurses and orderlies need instruction when asked to entertain such patients on a ward. But here again, the Atomic Energy Commission has been remarkably successful in making sure prior to distribution that those who will obtain the radioisotopes are capably trained and possessed of enough experience to enable them to employ proper safeguards. It would be surprising if there were not some backsliders who fail on occasion to be careful, but in general the situation is good.

Industry's use of radiation presents a problem of even greater magnitude, at least potentially. For in industry the operation which involves radiation may be large with a commensurately large radiation field associated with it. A few illustrations should make this clear.

Industrial x-ray installations present the same problems that one finds in medical situations. Sometimes, however, the nature of the work is such that it may seem too expensive to build in adequate protection. Again, the installation may be temporary. Present-day industrial management is not uninterested in safety for its employees, but pressures to save money may become very real. A binding safety code would be of help as a guide to management and as an aid in insisting on correction of unsound practices whenever found.

Radium-beryllium and polonium-beryllium mixtures are used as sources of neutrons in oil well logging. Neutrons require special shielding. The Atomic Energy Commission's polonium-beryllium sources are always provided with proper shielding, but the radium-beryllium sources are not under commission control and in some instances may need to be checked. More important in the realm of radiation protection is the way in which these neutron sources are used. They must be hauled

into the field, unloaded at the drill hole, removed from the storage container, and lowered into the ground. In the hands of an expert these operations need not present any problem, but if persons with little or no training use the device empirically, carelessness may creep into the situation. Supervisors should feel obligated to develop a sound procedure and to instruct operating personnel in what needs to be done to maintain safety.

Cobalt 60 and a few other radioisotopes are being used in industrial radiography, especially when the materials to be examined are in the field. Welded joints in cross-country pipelines are checked in this way. One company may be using as many as 25 sources at one time in various parts of the country. The low price of Cobalt 60, as compared with radium, has encouraged radiographers to procure larger and larger amounts, thus enabling them to extend their business. Field workers may have little or no training in handling radioactivity, having received just enough instruction to assure satisfactory radiographic results. The company accepts responsibility for safe handling, but this is one field in which checkups by a regulatory agency would be desirable.

In a recent article Hull has described no less than nine ways in which radioisotopes are used in the petroleum industry, including measurement of flow rate in pipelines and in catalytic crackers, volume determinations in large tanks, flow pattern in vacuum distillation, determination of complete mixing in surge tanks, and testing for leaks in heat exchangers. Each application employs only a limited amount of activity, but as this type of utilization spreads the wide dissemination of radioactive materials may become impressive.

Gamma emitters are used in liquid level gauges, especially in tanks containing heavy and optically dense liquids. Both beta and gamma emitters are components of thickness gauges. Several hundred of these may be installed at present; certainly, many more will be put in operation, because the market has hardly been touched so far. Static eliminators for the control of dust and curling in printing plants and in those manufacturing plastic sheets require rather intensive sources in order to ionize the air adequately. Strontium 90, mixed with suitable phosphors, is widely used in the production of luminous markers. These are placed on trucks, on doorways, and on personnel so as to mark their location in the dark when it is not feasible to operate with full illumination. All of these applications involve the use of sealed sources of radioactive materials. In some cases one wall of the capsule must be a thin foil which will allow beta particles to emerge. Obviously, such foils are subject to rupture with the consequent probability of contamination of the surroundings. The Atomic Energy Commission asks that such sources be checked each six months for leakage, but here again there is room for an enforcement program.

As a final illustration, the practice of labeling with a gamma emitter a small vital part of a complex assembly may be mentioned. Frequently, such a part may be left out by an operator on an assembly line and arrangements can be made to check each finished item with a detector provided with a mechanism which rejects those items in which there is no radioactivity. Usually each assembly need contain only a minute amount of radioisotope, but if the external wall is thick the amount must be increased. Furthermore, thousands of labeled parts may be involved in one day's run and precautions are needed to prevent undue exposure from a stock pile on the as-

sembly line. A survey of the operating procedure would be required to assure safety.

Future Problems in Industry

What about future problems in industry? We can be sure that nuclear reactors will be used for the production of power. We can be equally sure that radiation safety will be rigidly maintained in any building housing a reactor. All plans for reactor installations are carefully reviewed by a group of specialists in the Atomic Energy Commission and, in addition, the companies which build reactors will provide themselves with engineers and health physicists who are thoroughly familiar with the problems and their solutions. Construction sites are selected only after an exhaustive survey of prevailing weather conditions, natural drainage of surface waters, proximity of municipal water supplies, etc. There is some potential hazard due to the possibility of destruction by fire or military bombing attack, but the probability of such catastrophe is remote. We can be confident that safety precautions will be adhered to almost religiously in any reactor installation.

Another possible development is in the realm of food and drug sterilization. If the investigators can overcome such difficulties as impairment of flavor and nutritional value of foods and destruction of potency of pharmaceuticals, these materials may be processed with radiation exposures on a very large scale. Tremendous radiation intensities will be involved. The radiation in some cases may come from high energy particle accelerators, such as linear accelerators, or from hundreds of thousands of curies of a radioisotope. Here again, the best opportunity for control comes during the period of design and construction, with occasional review after completion to assure that good conditions are maintained.

Administrative Machinery for Control of Radiation Hazards

It seems clear that there is now, and in the future there will be increasingly, a need for governmental control of the use of ionizing radiation. Those who engage in control activities must have become familiar with a rather large mass of highly technical information, for wise judgment born of accurate information must be exercised in evaluating the extent of hazard in the many situations which will vary in complexity and in the intensity of the radiation involved. The Atomic Energy Commission will continue to exert rather effective control of radioisotope utilization through licensing procedures, but the commission cannot do the entire job. And it must be remembered that the commission has no control over the use of radium or of x-ray machines and particle accelerators. State and municipal regulation must be depended upon to complete the picture.

Whether the regulatory agency be the department of health, the department of labor, or some other department, it is highly desirable that only one department of a governmental unit be assigned the task. The need for official control is unfortunate at best and the level of regulatory activity should be held at the minimum commensurate with public safety. In the interest of consistent and defensible operation, control of radiation should be delegated to only one close-knit branch in the agency. The number of inspectors will be large or small, depending upon the load and inevitably upon the budget.

The code of regulations governing use of radiation will be somewhat different in different states and munici-

palities, because of variations in local laws and in the organizational characteristics of the agencies charged with the responsibility. But it would be highly regrettable if the code for California were at great variance with that in Pennsylvania, for example. Large industry must do business across state lines. Similarly, the code for the City of Philadelphia should be essentially the same as for the state at large. In an excellent editorial in "Nucleonics" for March, 1955, Lauriston S. Taylor said, "Pity the poor manufacturer of some radiation device, if for sale in a single state, he must make it comply with the requirements of State Health, State Labor, Municipal and Federal codes, all of which differ slightly in some essential detail."

Any group which attempts to draft a regulatory code should have at least one member who has had extensive experience in radiation protection. Drafters should be guided by free and intensive reference to the recommendations of the National Committee on Radiation Protection which represent the result of long deliberation by the most outstanding experts in the field. Regulations which are too restrictive, or perhaps ridiculous in some provisions, will only lead to widespread disregard and violation of the code.

Radiation can be used safely; its benefits to the public are great and will become even greater; adequate regulations governing such use should not and need not be so restrictive that the benefits cannot be realized legally. One important way to make sound progress in this important development is to make haste slowly and, finally, we must be ready to revise any code when our experience teaches us that changes are desirable.

National Research Council Science Fellowships for 1955–1956

The National Research Council of the National Academy of Sciences announces December 1, 1955, as the closing date for applications for seven different fellowships that it administers or recommends. The fellowships provide special opportunities for advanced study and training in fundamental research. They are intended for young men and women of unusual promise and ability in the early stages of preparation for an investigative career.

The fellowships are:

American Cancer Society Postdoctoral Fellowships in Cancer Research
British American Exchange Postdoctoral Fellowships in Cancer Research
James Picker Foundation Postdoctoral Fellowships in Radiological Research
National Tuberculosis Association Postdoctoral Fellowships in Tuberculosis
National Research Council Postdoctoral Fellowships in the Medical Sciences
Merck Senior Postdoctoral Fellowships in the Natural Sciences
American Chemical Society Petroleum Research Fund Postdoctoral Fellowships

The basic annual stipend for five of the fellowships is $3,800 with allowance for dependents up to a maximum of $4,850 and up to $500 for the institution in which the research is carried on. The Merck fellowships carry a somewhat larger stipend and the British Exchange Fellowship stipend is £1500.

Further information from The Fellowship Office, National Research Council, 2101 Constitution Avenue, N.W., Washington 25, D. C.

Height and Weight of First-Grade Children as a Potential Index of Nutritional Status

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Do height-weight measurements constitute a reliable running index of the nutritional status of school children? This is the first report upon a study designed to test the sensitivity and practicality of the underlying assumption.

A need has long been felt for a rapid and reliable method which would yield a continuing index of changes in the nutritional status of large population groups. Periodic measurements of height and weight in children constitute one approach to this problem since it is well established that the growth of children is influenced by nutrition. Numerous studies, particularly those conducted in Europe during and after World Wars I and II, have shown clearly that relatively severe nutritional deprivation and socioeconomic stress are accompanied by interference with normal growth rates in school children.[1] However, there are no studies which demonstrate the sensitivity and practicality of such measurements in detecting the relatively small changes in nutrition which one would expect under conditions usually prevailing in this country. The present study was designed to test this possibility.

The economic depression of the 1930's undoubtedly was the most severe socioeconomic stress which this country has endured in recent years. Whether this depression was severe enough to cause detectable increases in malnutrition is uncertain. Eliot[2] cited several studies indicating that the depression was associated with an increase in the percentage of underweight children, an increase in the number of children considered to be malnourished, and other illnesses. On the other hand, Palmer[3-5] found no height changes in children which could be associated with the depression. Among certain vulnerable economic groups he did find an increase in the percentage of six- to nine-year-old school children who were underweight. There were no significant changes at other ages or in other economic groups. In San Francisco, Geiger and Barrett[6] found children of parents on relief during the depression to be in as good nutritional state as the children from a higher economic group judged by height and weight and medical examination. McLester[7] found no evidence of an increase in malnutrition when he compared 1934 with 1927 height-weight measurements in school children from an industrial section of Birmingham.

Nevertheless, the depression of the 1930's should have offered the maximum opportunity to detect changes in growth trends of children, if such were present. We were fortunate to find that records of height and weight of public school children have been maintained in Philadelphia * since 1917. These records offered an opportunity to study the height and weight of children through the depression with adequate

* Division of Medical Services of the Board of Public Education, Philadelphia, Pa.

control data before and after the depression. These records were used in the present study.

Methods

With the advice of health and welfare workers in Philadelphia, a number of schools were selected which drew pupils from an area which had been consistently underprivileged economically during the period of our study (Group I). Similarly, schools were selected where the pupils came from an economically favored area (Group II). A third group of schools was selected from an industrial district where the economic state had been good before the depression, but which was affected severely for a time during the depression followed by rapid recovery to a normal economic condition (Group III). Schools were selected only if they had been in operation continuously during the period covered by our study.

The years 1932, 1933, and 1934 were selected to represent the depression era. The Industrial Research Department of the University of Pennsylvania * found that 1933 was the peak unemployment year in Philadelphia. The years 1925–1927 and 1947–1949 were selected as pre- and postcontrol periods of economic prosperity. Children who were in the first grade of school during each of these years were desired for our study. The medical records of children from the various Philadelphia public schools were filed alphabetically according to year of birth in a central repository for all children who had left or who had finished school. Consequently, files were selected from birth year 1919 when collecting data for first graders in 1925, from birth year 1920 for first graders in 1926, etc. In general this resulted in fairly homogenous six- to seven-year-old first-grade groups. Occasionally, data were included for a child whose entrance to first grade had been delayed beyond the usual six-year age.

Collection of data for 1947–1949 first-grade groups differed in that these records were in the individual schools and not yet organized by year of birth in the central repository. These groups were formed from the records of children who were in the fourth, fifth, and sixth grades in the desired schools during the year of data collection (September, October, 1952). To make the data comparable to those of previous years, the records were tallied according to year of birth with everyone born in 1941 recorded in one set, those in 1942 in another set, etc. The data were recorded only if the children were first graders in one of the schools selected for study. The groups so obtained were somewhat more uniform in age than groups obtained from the central repository.

Data were collected for 400 children (approximately equally distributed between boys and girls) from Group I schools and a like number from Group II and from Group III schools in each of the nine years selected for the study. The following data were recorded for each child: height (to nearest one-half inch, without shoes), weight (to nearest one-half pound, in ordinary clothing), year and month when measurements were made, year and month of birth, sex, white or Negro, school attended, and initials of names (to assure random

* We are indebted to Gladys L. Palmer of the Wharton School of Finance for making this information available to us.

Dr. Hundley is chief and Dr. Mickelsen assistant chief of the Laboratory of Biochemistry and Nutrition, Mr. Mantel is a statistician in the National Cancer Institute, National Institutes of Health, Public Health Service, U. S. Department of Health, Education, and Welfare, Bethesda, Md. Dr. Weaver is director of the Division of Medical Services and Mr. Taber is director of the Division of Pupil Personnel and Counseling, Board of Public Education, Philadelphia, Pa.

Table 1—Age-Height-Weight Data on 6–7-Year-Old Children from Poor (Group I), Good (Group II), or Variable (Group III) Socioeconomic Environments

	Birth Year	1919	1920	1921	1926	1927	1928	1941	1942	1943
	School Year *	1925	1926	1927	1932	1933	1934	1947	1948	1949
Age † in months	Group I	82.00	78.54	77.92	79.09	76.75	76.70	74.58	74.84	73.86
	Group II	79.53	78.10	75.77	76.54	75.46	75.34	73.36	73.69	73.15
	Group III	81.17	77.57	76.42	77.67	75.91	75.41	75.17	73.72	73.94
Height ‡ in inches	Group I	45.09	44.53	44.37	45.41	44.85	44.57	45.22	45.66	46.25
	Group II	46.23	45.76	45.74	45.69	45.71	45.62	46.27	46.32	46.29
	Group III	45.21	44.95	44.80	45.20	45.03	45.29	45.51	45.56	45.66
Weight ** in pounds	Group I	46.25	45.00	44.67	46.80	45.18	44.99	45.63	46.52	46.73
	Group II	47.52	46.46	46.60	47.51	47.23	47.14	49.28	49.16	48.44
	Group III	45.53	45.25	44.77	45.58	44.74	45.39	46.45	46.95	46.31
Number of children	Group I	406	410	403	408	400	401	416	407	422
	Group II	400	404	395	407	403	410	399	403	413
	Group III	398	414	415	404	411	410	392	425	399

* Most but not all were first-grade children in the year indicated (see text).

† The standard deviations for age in months varied from 4.6 to 10.4 in the birth years 1919–1921, and 1926–1928; and from 2.7 to 4.8 in 1941–1943. Standard deviations for Group I tended to be highest, Group II lowest.

‡ The standard deviations for height varied from 2.0 to 2.6 with no consistent difference for 1919–1921 vs. 1926–1928 vs. 1941–1943 and no consistent differences were seen among Groups I, II, and III.

** The standard deviations for weight varied from 5.4 to 7.9 with no consistent variations among Groups I, II, or III. Children in birth years 1941–1943 tended to have slightly larger standard deviations than those in other years.

alphabetical distribution and to permit rechecks of records if needed). The data as collected for 10,975 children in the study are summarized in Table 1.

Results and Analysis of Data

To determine the significance of the collected data several steps seemed indicated. First, preliminary analysis and comparison of heights and weights (age adjusted) in Groups I, II, and III showed that Group III was intermediate in nearly all respects between Groups I and II. Since it seemed most advantageous to study the two groups with the largest differences, Group III was eliminated from any further analysis in this study. Second, it was found that Group I contained about 42 per cent Negro children, whereas Group II contained less than 1 per cent. Furthermore, the percentage of Negro children in Group I during the depression years was nearly twice that in the 1920's or the 1940's. Consequently, all Negro children were eliminated from any further study. The data for the remaining children (white) were consolidated for each three-year period and separated by sex as shown in Table 2.

Rates of gain in height and gain in weight in children have been reported to vary, separately to some extent, with the season of the year.[8] The children in this study were measured at various

Table 2—Unadjusted Means for Age, Height, and Weight (White Children Only)

		Group I *			Group II †		
	Birth Year	1919–1921	1926–1928	1941–1943	1919–1921	1926–1928	1941–1943
Age in months	Boys	78.49	76.75	74.29	77.59	75.76	73.43
	Girls	78.76	75.87	74.38	77.85	75.77	73.43
Height in inches	Boys	44.36	44.67	45.38	46.08	45.74	46.42
	Girls	44.23	44.31	45.13	45.76	45.60	46.11
Weight in pounds	Boys	45.28	45.65	46.78	47.65	47.78	49.43
	Girls	43.98	43.99	45.44	46.10	46.82	48.48
Number of Children	Boys	430	227	446	576	590	687
	Girls	389	202	409	616	623	692

* The children in this group attended schools in an economically underprivileged area.
† The children in this group attended schools in an economically favored area.

times throughout the school year. The distribution by month of examination was reasonably but not completely uniform from group to group. Consequently, the data were analyzed by subdividing each of the groups shown in Table 2 into subgroups according to whether they were examined early (August–December) or late (January–June) in the school year. A comparison of these subgroups showed very small differences and no consistent trend as to average height, weight, or rate of gain in height and weight with time of examination. Consequently, no further consideration was given to possible variations due to season. Apparently seasonal effects are not as important in considering attained heights and weights as in their rate of change.

The data in Table 2 show considerable variation in the average age of the various groups. Since average height and weight vary with age, it was necessary to adjust the data to a common age before exact comparisons could be made between groups. Simple regressions for height versus age and weight versus age were calculated for each of the groups.[9] The respective average values, 0.137 inches per month and 0.259 pounds per month, were used to adjust average height and weight to the mean age of the children in the study (76 months). In addition, children's weights were adjusted for both their ages and heights. This provides an index of stockiness or leanness and would indicate whether or not there had been a change in the relationship between weight and height. These data are shown in Table 3.

Table 3 indicates clearly that children of the same age in both Groups I and II who were in the first grade in 1947–1949 (birth years 1941–1943) were taller by 0.91 to 1.59 inches and heavier by 2.59 to 3.53 pounds than were first-grade children in 1925–1927 (birth years 1919–1921). The increases in height were greater in the Group I children, whereas the increases in

Table 3—Adjusted Heights and Weights

Birth Year	Group I *			Group II †		
	1919–1921	1926–1928	1941–1943	1919–1921	1926–1928	1941–1943
	Height (inches) adjusted to age 76 months (adjustment: 0.137 ± 0.005 inches/month)					
Boys	44.02 ± 0.10	44.57 ± 0.13	45.61 ± 0.09	45.86 ± 0.08	45.77 ± 0.08	46.77 ± 0.08
Girls	43.85 ± 0.10	44.33 ± 0.14	45.35 ± 0.10	45.51 ± 0.08	45.63 ± 0.08	46.46 ± 0.08
	Weight (pounds) adjusted to age 76 months (adjustment: 0.239 ± 0.016 pounds/month)					
Boys	44.63 ± 0.31	45.46 ± 0.43	47.22 ± 0.31	47.34 ± 0.27	47.84 ± 0.26	50.10 ± 0.25
Girls	43.26 ± 0.33	44.02 ± 0.45	45.86 ± 0.32	45.62 ± 0.26	46.68 ± 0.26	49.15 ± 0.25
	Weight (pounds) adjusted to age 76 months, height 45 inches (adjustment: − 0.062 ± 0.011 pounds/month; 2.344 ± 0.029 pounds/inch)					
Boys	46.94 ± 0.22	46.47 ± 0.29	45.78 ± 0.21	45.22 ± 0.19	46.03 ± 0.18	45.94 ± 0.18
Girls	45.96 ± 0.23	45.60 ± 0.23	45.04 ± 0.22	44.43 ± 0.18	45.40 ± 0.18	45.72 ± 0.18

± = standard error of the mean.

Heights and weights were adjusted through the use of fitted least squares,[9] common slope lines (or planes) of regression relating height to age, weight to age, and weight to both age and height.

* The children in this group attended schools in an economically underprivileged area.

† The children in this group attended schools in an economically favored area.

weight were greater in Group II. A secular increase in growth has been noted by other investigators in this country.[10, 11]

It is also evident that the economically favored children in Group II were consistently taller and heavier than were children in Group I. The children in Group I appear to have attained about the same growth potential in 1947–1949 as children in Group II had achieved already in 1925–1927. Similar differences in stature and weight between groups of children of higher and lower socioeconomic status have been found by many investigators.[3–5, 10, 11]

The data for Group I show no detectable influence of the depression period (birth years 1926–1928) on the secular trend upward in height and weight (Figure 1). On the other hand, the data for Group II show a definite change during the depression years (Table 3). This is especially evident in height for boys who were significantly shorter in 1932–1934 than would be expected from the secular trends between 1925–1927 and 1947–1949. Height in girls and, to a lesser extent, weight in boys also increased less than expected from the secular trend but these differences were not significant statistically (Figure 1). Weight in girls showed no deviation from what

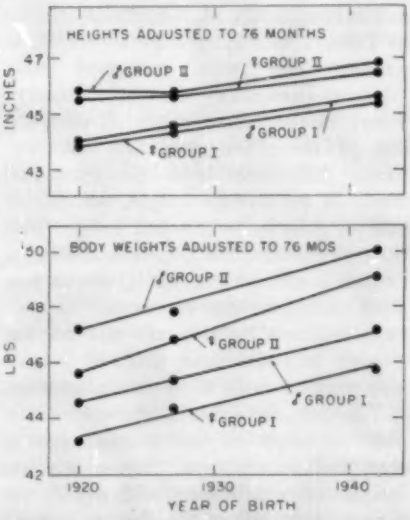

Figure 1—Secular Trend in Heights and Weights Adjusted to Age 76 Months

would be expected. Calculations were also made to adjust weight for age and to a common height of 45 inches. This yields a picture of relative stockiness of the children, that is, body weights with the influence of height and age removed.

It is evident that Group I children were initially stockier than Group II, but have become less stocky in recent years. Group II children were initially less stocky than Group I but have become stockier so that both Groups I and II children were approximately the same in this respect in 1947–1949. Group II boys and girls were stockier during the depression years than would have been expected from their trend of stockiness during the period of our study (Figure 2). This increased stockiness might be expected since, as noted previously, these children failed to gain in height as expected but did gain some in weight when comparing the depression period heights and weights to pre- and post-depression figures.

Discussion

The principal purpose of this study was to test the hypothesis that periodic measurements of height and weight in six- to seven-year-old first-grade children might yield an index of nutritional status of sufficient sensitivity to detect favorable or unfavorable trends of less

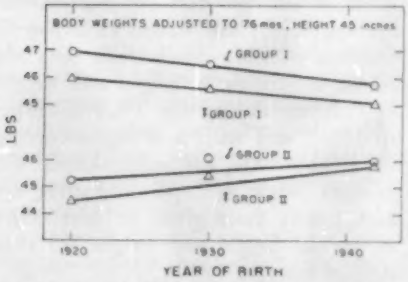

Figure 2—Secular Trend in Body Weights Adjusted to 76 Months and 45 Inches

than "mass starvation" magnitude. The results support the hypothesis in that if such studies had been conducted beginning in the 1925–1927 period and continued through the depression years, statistically significant deviations in growth patterns would have been found which would have suggested more definitive study and possible remedial action. Studies of this type would not, of course, establish that the observed alterations in growth patterns were due to nutritional factors. The social and economic unrest and instability characteristic of the depression years undoubtedly were causally related also.

A surprising finding in our study was the fact that depression effects were seen only in children from economically favored areas. Any attempt to explain this finding would be highly speculative. However, it should be noted that the present study does not indicate any deterioration in growth of the Group II children; the absence of an expected (secular) increase was found. If the true cause of this phenomenon were nutritional, then one might say that the depression years were characterized by a temporary cessation of a trend toward constantly better nutrition in the case of the Group II children, but a continuation of a trend upward in Group I children who were originally on a lower plane of nutrition than Group II children. This situation would be analogous in some respects to the disproportionate nutritional gains made by the lower economic third of our population during World War II.[12]

It is possible that depression effects might have been present in Group I children prior (i.e., 1930–1932) to the period selected for our study. This seems unlikely since one then would expect some lowering of the average attained heights and weights in 1932–1934 below what would be expected from the secular trend between 1925–

1927 and 1947–1949. This was not observed. In addition, it is possible that the apparent cessation of the secular growth trend upward in Group II children could have been due to a migration of families from Group I areas to Group II areas, thus diluting the Group II sample with the shorter and lighter children. This seems unlikely for economic reasons and Philadelphia officials report that such a migration did not occur to any detectable extent. Furthermore, other parts of this study dealing with longitudinal growth patterns of children who remained in the same economic type of school area during the depression years lend no support for this possibility.[13] Also, it is quite possible that the apparent continued secular increase in height and weight of the Group I children could have been due to the families most severely afflicted by the depression moving to other areas or leaving the city, thus removing the shortest and lightest groups from our sample. City officials report such a movement during this period. In addition, the fact that our total sample (Table 1) of Group I children included nearly twice the number of Negro children during the depression compared to 1925–1927 and 1947–1949 indicates a considerable movement of families during this period in Group I areas. Although the final analysis of our data eliminated all Negro children, it is quite possible that a similar movement had occurred in white families.

Our finding of a "depression effect" on attained heights and relative stockiness of children is not incompatible with the negative studies of McLester[7] and the results of Palmer.[3–5] These investigators compared children in the depression period to a control period in the 1920's and found no difference in attained heights[3–5, 7] and weights[7] or variable results in weight of various age-sex-economic groups[3–5] between the two periods. Had these investigators been able to have a postdepression control period to observe secular increases in heights and weights, it should have been clear that the depression period children were departing from normal by virtue of not keeping up with their secular trend. Indeed, later studies by Wolff[14, 15] in the same schools studied by Palmer did show a secular trend upward in weight but not in height between 1937 and 1940. In addition, it could be expected that "depression effects" would be detectable more quickly if rates of growth were studied since some lag would be anticipated before significant deviations appeared in attained heights and weights. A subsequent paper will deal with this point.[13]

The present study reveals no evidence of a plateau in the secular increase in growth. However, our data cannot be considered as crucial on this point since it is possible that the birth year 1941–1943 data (especially for Group II) may represent measurements on a plateau the peak of which occurred at some earlier time. Moreover, another portion of our studies which deals with longitudinal growth patterns in the same children[13] will present evidence that economically favored children may have reached their peak rate of growth under currently prevailing conditions. It is of interest that our figures for average height and weight of Group II children coincide closely with data obtained in studies of height and weight of children during the 1930–1945 period[16, 17] and with a study conducted in 1950.[18] On the other hand, our average height and weight figures are higher than those given in older tables of normal height and weight for children of this age.[19, 20]

The present study is subject to certain limitations. Our interpretation of

the data has been based on the assumption that the secular trends in height and weight over the period covered by our study are essentially straight line rather than curvilinear functions. There is no conclusive evidence on this point. The data reported in the present paper show a straight line function for height, weight, and stockiness for Group I children but, since only three points in time are available to establish the line, this can be regarded as only suggestive. In addition, it is impossible at this time to evaluate population changes in the different groups over the period of our study. These limitations may be clarified as the result of further studies, which seem indicated, to test the usefulness of height-weight measurements in children as a continuing index of nutritional status.

Conclusions

The heights and weights of first-grade children in the Philadelphia public schools were secured from the medical records for the periods 1925–1927, 1932–1934, and 1947–1949.

The data indicate that children from economically favored areas were taller and heavier than children from economically underprivileged areas. Both economic groups of children showed a secular increase in growth. During the depression years, 1932–1934, children from the lower economic areas showed no interruption in their secular trend. On the other hand, children in the economically favored areas during the depression did show a significant deviation from their secular trends. This deviation was statistically significant for height in boys and for stockiness in both boys and girls.

Although the data are not conclusive, they do indicate that further tests should be made of the reliability of height-weight measurements of school children as a continuing index of nutritional status. The difficulties that arise in such a problem are discussed.

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A Delayed Incubation Membrane Filter Test for Coliform Bacteria in Water

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This paper will have direct and immediate interest for laboratory workers, public health engineers, and administrators who may be concerned with the accuracy of laboratory examinations of shipped water specimens.

The ninth edition of Standard Methods for the Examination of Water and Sewage [1] recommends that the bacteriologic examination of relatively pure water be started within 12 hours after collection and that the temperature of the sample be maintained between 6–10° C. Many laboratories serving large geographic areas have found it impractical or impossible to comply with one or both of these recommendations.

The exact effects of time and temperature of storage on the coliform densities of water appear to be controversial. Cox and Claiborne [2] found that refrigerated samples showed relatively little change up to 48 hours. Coliform densities in their samples stored at room temperature varied markedly, frequently showing sharp reductions. Hoather [3] found little evidence of large variations of coliform counts in samples stored one and two days at 5° C and at 20° C. Using statistical methods he estimated an average 12 per cent decrease of coli-aerogenes organisms, other than Escherichia coli in samples stored 24–48 hours at 5° C. This change was not considered significant from the viewpoint of practical hygiene.

The Public Health Laboratory Service Water Subcommittee in Great Britain reported [4, 5] significant changes in coliform and E. coli densities after six and 24 hours storage at refrigerator and room temperature. The following percentages of samples which at least doubled or halved the original coliform content were: (a) on storage at room temperature after six hours 24.7 per cent, and after 24 hours 38.3 per cent; (b) on storage at refrigerator temperature after six hours 25.0 per cent, and after 24 hours 33.9 per cent. Similar changes which occurred in the E. coli content on storage were: (a) at room temperature after six hours 18.7 per cent, and after 24 hours 34.6 per cent; (b) at refrigerator temperature after six hours 10.4 per cent, and after 24 hours 25.0 per cent. This investigation showed, however, that fewer changes occurred after six hours than after the longer storage period. Jones, et al., [6] reported that 21 per cent of their samples showed a significant reduction and that another 10 per cent showed a significant increase in coliform density after 18 hours storage at 3–5° C.

While these differences in findings are in part due to differences in testing procedures and standards of evaluation, the variations also indicate the unpredictability of the effects of storage time and temperature on the coliform group. This is especially true when it is necessary to consider a large number of water samples from various sources in widely separated geographic areas. These reports suggest that time-temperature effects may vary with any one

or any combination of chemical composition, hydrogen-ion concentration, electrolyte concentration, protein nitrogen, types of bacterial flora present, and perhaps other unknown factors in individual water samples.

To secure results most accurately reflecting coliform density of the sample source, bacteriologic examination should be initiated at the time of sample collection, a procedure not always practical with current methods. The membrane filter technic, however, may be adapted to such a method. An appropriate quantity of water is filtered at the sample collection site and the membrane is placed on a medium which preserves viability of the microorganisms and, at the same time, prevents rapid multiplication during transportation to the laboratory. In the laboratory the viable coliform bacteria can be cultivated and enumerated by procedures applicable to the membrane filter.

Removal of the bacteria from their natural habitat to a standardized environment during the interval between collection and examination reduces many sources of unpredictable quantitative changes. This presupposes adequate rinsing of the membrane following sample filtration. Shipe and Cameron [7] recently found evidence in a comparison of the membrane filter with the MPN procedure on several water sources that repeated lower membrane filter counts in one river sample were possibly caused by the presence of toxic industrial wastes. In further investigations, Shipe and Fields [8] demonstrated that a toxicity to coliforms may build up on membrane filters from some water samples with industrial effluents containing copper and zinc.

The possibilities of quantitative coliform increase due to cellular multiplication are removed because the organisms are isolated on a solid surface. Each cell will theoretically become a countable colony. Other advantages of the method are decreased weight per sample, small size, low cost of sample container, and transportation to the laboratory by first class or air mail without refrigeration.

To produce an ideal environment for delayed incubation of the coliform group a preservative medium should permit survival of all coliform bacteria for at least 24 hours within the temperature ranges likely to be encountered while the membrane is in transit to the laboratory. Multiplication of coliform organisms should be suppressed or reduced to a negligible rate, while growth of noncoliform organisms should be inhibited or markedly restricted. There should be no carryover of growth-suppressive effects from the preservative medium. That is, the growth rate for members of the coliform group should quickly become normal when the membrane is transferred to the usual differential medium for cultivation of coliforms on the membrane filter.

Preservative materials that have been investigated in this laboratory in preliminary studies include alcohols, sulfa compounds, phenol, mercurials, sodium benzoate, salicylates, and others. These substances were tested in varying concentrations in buffered solutions as well as in mixtures with different concentrations of bacterial culture media. Of the materials studied, sodium benzoate added to EHC Endo medium seemed

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Mr. Geldreich, bacteriologist, Dr. Kabler, chief of microbiology, Mr. Jeter, bacteriologist, and Mr. Clark, bacteriologist in charge of Bacterial Studies Unit of Microbiology, are with Water Supply and Water Pollution Control Research, Robert A. Taft Sanitary Engineering Center of the Public Health Service, U. S. Department of Health, Education, and Welfare, Cincinnati, Ohio.

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most nearly to meet the characteristics desired of a preservative medium for use with the membrane filter at room temperature and 35° C. Use at 5° C did not give satisfactory results.

This investigation has been designed for the accumulation of quantitative data with respect to the application of a benzoated preservative medium with the membrane filter under field conditions.

Experimental Procedure

Six sample sources consisting of three rivers, two farm wells, and a lake were examined. These sources were selected to fall within two groupings as to coliform density. The first group consisted of two farm wells and a lake, representing sources for which the density was less than 500/100 ml. The remaining three sources usually showed a coliform density range from 500 to 500,000/100 ml.

From each source three samples were examined in the winter and then repeated the following summer. Testing of water samples under these markedly different temperature conditions was designed not only to reveal any inherent weakness of the preservative medium, but also to evaluate the medium with both a cold temperature and a warm temperature bacterial flora.

Examinations of all samples for coliform density were initiated within two hours after collection and were made by three different methods. These tests consisted of a membrane filter (MF) procedure with use of a preservative medium for delayed incubation of MF's after sample filtration, a routine MF procedure, and the Standard Methods most probable numbers (MPN) procedure.[1]

For the delayed incubation coliform tests the samples were filtered and the membrane placed on nutrient pads saturated with benzoated Endo medium.* Following placement of the filters on the preservative medium the Petri dishes were individually wrapped in squares of "Parafilm" to minimize evaporation during the storage period. The membranes were held on the preservative medium under different temperature conditions for the various time intervals specified in the experimental procedure. At the expiration of the designated storage periods the membranes were transferred to fresh nutrient pads saturated with EHC Endo medium and incubated 18 hours ± 2 hours.

The methods of Clark, et al.,[9-13] were used for the routine MF coliform tests. The procedure consisted, briefly, of sample filtration and placement of the membranes on nutrient pads saturated with M-enrichment medium. The membranes were incubated two hours, transferred to nutrient pads saturated with EHC Endo medium, and incubated 18 hours ± 2 hours at 35° C in a high humidity atmosphere.

Coliform enumerations on MF's were made at the end of the incubation period on EHC Endo medium. Magnification of 15 diameters with vertical illumination was used for optimum recognition of colony differentiation. For ease of comparison of MF coliform estimates with MPN results, MF colony counts were computed as coliforms per 100 ml of sample.

Five-tube tests with three decimal dilutions were used in the Standard Methods coliform measurements. Lauryl sulfate tryptose broth was used in the presumptive tests, with confirmation in brilliant green lactose bile broth 2 per cent.

Each original sample was vigorously mixed to insure even distribution of the contents. Three portions (see

* See appendix for details of preparation of the preservative medium, indicator powder, and culture media.

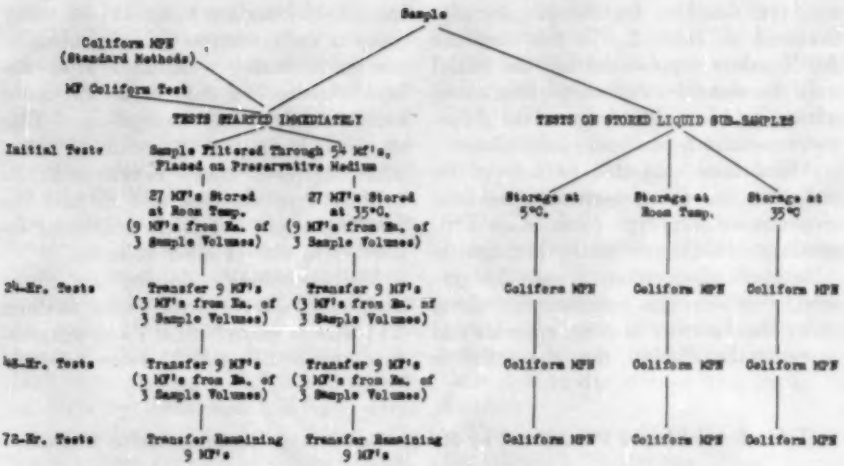

Figure 1—Schematic Outline of the Experimental Procedure

Figure 1) were dispensed into sterile containers and stored in the refrigerator at 5° C, at room temperature,* and at 35° C respectively. The remainder of the sample was used for coliform tests initiated immediately, consisting of a Standard Methods five-tube MPN test, a routine membrane filter test, and MF delayed incubation tests.

Triplicate filtrations of three sample volumes were made for the routine MF tests. Sample increments were selected to secure at least two volumes yielding easily countable (up to 100 coliform) colony densities on the filters.

For the MF delayed incubation tests 18 replicate filtrations were made from each of the same three sample volumes as used in the routine MF test. Nine replicate membranes from each of the sample volumes were stored at room temperature and nine were stored at 35° C.

After 24 hours the original MPN test was examined, results recorded, and the necessary transfers made. Record was made of the number of coliform colonies on the incubated MF's and those filters were then discarded.

MPN tests were initiated on the stored liquid samples. Results of tests from the previous day were used as a basis for determining dilutions expected to produce determinate MPN results.

Three stored MF's of each filtration volume were withdrawn from the respective storage conditions (room temperature and 35° C), transferred to EHC Endo medium, and incubated for the usual 18 hours ± 2 hours.

Examination of results, initiation of new tests, and transfer of stored MF's were made at 48 and 72 hours, in the same manner as for the 24-hour steps.

Results and Discussion

Table 1 shows the coliform counts determined by the MF method, both initially and after storage on the preservative medium. Each numerical value represents the average of 6 MF results computed to denote coliforms per 100 ml of sample.

Table 2 records the MPN estimates of

* The recorded room temperature for the winter series was from 13 to 27° C; during the summer this range was from 22 to 32° C.

coliform densities for the samples represented in Table 1. In this case the MPN values represented are the initial coliform densities and those determined after liquid sample storage at the different time and temperature conditions.

Membranes subjected to delayed incubation on the preservative medium produce coliform-type colonies on EHC medium which are easily distinguishable from other colony types. In general, coliform-type colonies are about twice the diameter of other colonies and consistently display the characteristic metallic-like surface luster. From many samples coliform-type colonies actually are more easily recognized after delayed incubation than with the more rapid conventional procedure. This seems to be in part the result of somewhat improved sheen development on coliform-type colonies and in part the result of slight but fairly consistent reduction in size of other colonies.

Visible colonies develop on filters maintained on the preservative medium 24 hours or more both at room temperature and at 35° C. At room tempera-

Table 1—Coliforms Per 100 ml by MF Method Storage on Preservative Medium

Sample				Storage at Room Temperature *			Storage at 35° C		
			Initial	24 hr.	48 hr.	72 hr.	24 hr.	48 hr.	72 hr.
Well No. 6	Mar.	18	0.95	1.1	2.0	1.2	1.3	14	1.9
		23	1.0	1.0	1.7	6.0	0.93	2.1	14
		25	0.72	0.51	0.51	4.0	0.27	<0.50	3.0
	July	1	58	48	47	54	23	40	36
		8	12	28	25	34	18	20	18
		15	6.9	3.9	3.5	7.0	2.3	4.0	5.1
Well No. 5	Mar.	2	6.0	6.2	5.0	9.2	6.0	18	14
		9	8.9	8.4	8.5	9.5	8.9	11	10
		16	3.4	4.6	75	52	14	19	21
	June	3	22	62	34	57	36	33	54
		10	59	79	96	87	39	44	47
		24	320	160	220	130	110	130	130
Burnet Lake	Jan.	7	9.0	18	12	16	15	9.0	10
		21	130	140	150	140	140	150	120
		28	110	110	110	80	130	130	120
	July	20	240	160	190	160	100	140	150
		27	310	280	260	270	220	270	360
	Aug.	12	740	620	700	630	340	580	550
Ohio River, Calif.	Feb.	18	320	220	360	650	260	320	350
		25	1,100	1,800	1,900	1,700	1,700	1,700	1,100
	Mar.	4	3,400	2,600	4,100	4,500	2,750	2,500	2,900
	July	22	1,500	1,100	970	1,100	600	870	1,100
	Aug.	3	210	180	290	270	140	140	180
		17	30	92	160	69	14	20	23
Little Miami River	Feb.	2	4,100	3,000	2,800	3,500	2,100	2,700	1,900
		9	1,900	3,160	2,400	2,700	2,300	1,400	1,700
		16	500	470	750	1,100	300	490	440
	June	22	28,000	18,000	20,000	6,700	11,000	3,700	9,300
		29	2,600	2,700	1,800	2,300	1,200	1,400	3,500
	July	6	16,000	17,000	14,000	14,000	13,000	17,000	14,000
Ohio River, Broadway	Jan.	5	180,000	170,000	180,000	210,000	110,000	120,000	150,000
		12	58,000	72,000	91,000	83,000	74,000	69,000	46,000
		26	18,000	15,000	16,000	18,000	9,000	14,000	14,000
	June	1	270,000	160,000	190,000	260,000	89,000	120,000	130,000
		8	300,000	190,000	210,000	260,000	140,000	130,000	170,000
		15	180,000	130,000	140,000	180,000	58,000	100,000	160,000

* Storage at room temperature was in the range of 13–27° C in the tests made January to March and in the range of 22–32° C for the tests made June to August.

ture the colonies usually are quite small, while at 35° C they are larger although considerably smaller than those developing after incubation on EHC Endo medium. Some colony differentiation occurs on the preservative medium, frequently with good sheen development. It appears that the sodium benzoate in the preservative medium is a factor in reducing bacterial growth on stored MF's at usual temperatures for growth.

Mold colonies occasionally develop on some MF's preserved 48 and 72 hours. The medium is sufficiently inhibitive to prevent complete overgrowth of MF's by these mold colonies; their presence does not appear to affect coliform colony growth or differentiation.

The data summarized in Tables 1 and 2 were analyzed by several different methods, all arriving at the same general conclusions. The most thorough and precise analysis, using the "analysis of variance" technic, was undertaken by the statistical staff of the Sanitary Engineering Center.

A simpler method of analysis involved computing ratios, using the corresponding initial MPN value as the standard of comparison, i.e., the common denominator. Table 3, an example of these ratios, was prepared from representative low- and high-density samples under both winter and summer conditions.

The upper third of Table 3 reveals that, in the high-density sample, the MPN undergoes a continuous decline with storage beyond 24 hours, unless the sample is refrigerated. In low-density samples, this decline is not seen consistently, except at warm temperatures. Within the first 24 hours a sharp rise in count may occur at any temperature.

The middle third of Table 3 shows that samples after storage compare favorably with the initial membrane filter values. Median values for low-density (coliform) samples at room temperature are 1.20, 1.25, and 1.50 after 24, 48, and 72 hours storage, while high density samples have medians of 0.78, 0.84, and 1.00. At 35° C storage temperature, medians for low-density samples are 1.00, 1.37, and 1.73 and for high-density samples 0.48, 0.61, and 0.79. In both types of samples the count is best maintained when storage is at room temperatures. The decline in count appears (in this series of samples) to be more closely related to the coliform density of the initial sample than it is to the storage time up to 72 hours.

The lower third of Table 3, comparing delayed membrane filter counts with initial MPN's reveals approximately the same situation as in the middle third, with respect to high-density samples. In low-density samples the ratios were generally smaller than the corresponding figures in the middle third of the table, indicating that at low densities, initial MF counts tend to be appreciably lower than initial MPN's. This finding is in agreement with the results of Kabler [12] and Jeter, Geldreich, and Clark.[13]

In one case the MF failed to demonstrate coliforms on the preservative medium (after 48-hour storage at 35° C). This represents 0.5 per cent of the 216 delayed incubation tests. At the same time 27 determinations of 324 MPN coliform counts made on stored liquid samples resulted in indeterminately low counts (MPN less than 1.8/100 ml).

Two factors contributed to the excess of indeterminate MPN values over indeterminate MF coliform counts. First, the MF procedure frequently was based on the testing of larger sample volumes than the MPN. Whereas the MPN for low coliform density was determined by testing 55.5 ml (with 1.8/100 ml the lowest possible determinate result),

Table 2—Coliforms Per 100 ml by MPN Method
Stored Liquid Samples

Sample		Initial	Storage at 5° C			Storage at Room Temperature *			Storage at 35° C		
			24 hr.	48 hr.	72 hr.	24 hr.	48 hr.	72 hr.	24 hr.	48 hr.	72 hr.
Well No. 6	Mar. 18	33	49	33	13	49	33	4.0	4.5	<1.8	<1.8
	23	33	49	23	11	21	13	4.5	<1.8	<1.8	<1.8
	25	23	33	7.8	22	7.8	13	7.8	2.0	7.8	<1.8
Well No. 5	Mar. 2	79	70	2.0	2.0	17	4.0	4.5	17	2.0	<1.8
	9	17	17	17	23	17	9.3	4.5	22	4.0	2.0
	16	7.8	17	6.8	4.5	13	13	<1.8	4.5	11	2.0
Burnet Lake	Jan. 7	22	33	13	13	7.8	23	9.3	2.0	<1.8	1.8
	21	130	540	540	130	240	220	11	540	540	23
	28	350	110	49	130	330	49	17	130	79	33
Ohio River, Calif.	Feb. 18	330	180	49	33	17	23	2.0	430	2,200	5,400
	25	5,400	1,300	1,700	490	210	79	130	170	33	23
	Mar. 4	3,300	1,300	1,100	2,600	1,300	700	490	1,300	1,700	5,400
Little Miami River	Feb. 2	4,900	1,100	2,300	1,100	1,200	310	45	1,100	1,400	330
	9	13,000	790	1,300	1,300	1,700	490	130	1,700	490	23
	16	460	330	490	310	330	70	79	270	70	4.5
Ohio River, Broadway	Jan. 5	130,000	490,000	170,000	230,000	490,000	70,000	22,000	1,700,000	11,000	7,900
	12	70,000	79,000	79,000	460,000	170,000	79,000	49,000	490,000	79,000	23,000
	16	28,000	17,000	17,000	17,000	33,000	4,900	1,700	33,000	3,300	4,900

* Room temperature was 13-27° C in this series of tests.

Table 2 (Continued)

Sample		Initial	Storage at 5° C			Storage at Room Temperature †			Storage at 35° C		
			24 hr.	48 hr.	72 hr.	24 hr.	48 hr.	72 hr.	24 hr.	48 hr.	72 hr.
Well No. 6	July 1	130	110	33	49	11	2.0	6.8	<1.8	<1.8	240
	8	17	17	6.8	46	23	2.0	<1.8	<1.8	<1.8	<1.8
	15	7.8	4.5	11	11	7.8	<1.8	<1.8	<1.8	<1.8	<1.8
Well No. 5	June 3	79	33	31	33	17	130	22	17	4.0	<1.8
	10	33	23	13	49	11	17	23	23	11	<1.8
	24	490	350	490	490	>1,600	3,500	2,200	220	49	2.0
Burnet Lake	July 20	330	330	130	110	33	110	9,200	33	4.0	2.0
	27	490	170	330	220	110	79	23	330	130	49
	Aug. 12	490	2,400	1,100	330	1,400	490	1,300	310	9,200	95
Ohio River, Calif.	July 22	3,100	790	1,300	1,300	1,700	170	330	110	79	49
	Aug. 3	1,300	230	79	49	4.5	4.5	4.5	4.5	4.5	7.8
	17	230	22	1.8	2.0	3.6	<1.8	<1.8	79	<1.8	<1.8
Little Miami River	June 22	22,000	11,000	22,000	11,000	22,000	3,300	1,700	4,900	2,200	330
	29	24,000	4,900	3,100	2,200	330	230	46	490	61	33
	July 6	49,000	35,000	33,000	17,000	92,000	79,000	33,000	13,000	11,000	2,700
Ohio River, Broadway	June 1	1,700,000	490,000	790,000	1,100,000	490,000	33,000	17,000	130,000	4,500	2,300
	8	170,000	330,000	3[illegible],000	230,000	230,000	49,000	11,000	220,000	49,000	14,000
	15	130,000	1,100,000	330,000	490,000	79,000	33,000	23,000	330,000	7,800	13,000

† Room temperature was 22–32° C in this series of tests.

MF determinations frequently were based on samples up to 400 ml or more (with 0.25/100 ml the lowest possible determinate result), according to the predicted coliform density. Thus, the MF technic may be expected to produce routinely a greater percentage of determinate coliform counts than the routine MPN determination. Second, there was unquestionably an appreciable progressive reduction of coliform density during storage of liquid samples as demonstrated by the MPN results, particularly with samples which were not refrigerated. This reduction of coliform count either did not occur, or occurred at a reduced rate, on MF's stored on preservative medium within the limits of the study.

General effects of temperature and

Table 3—Ratios of Coliform Counts from Representative Low- and High-Density Samples

Sample			MF	Storage at 5° C			Storage at Room Temperature			Storage at 35° C		
			Initial	24 hr.	48 hr.	72 hr.	24 hr.	48 hr.	72 hr.	24 hr.	48 hr.	72 hr.
				Ratios of Stored MPN Coliforms to Initial MPN Coliform Counts								
Well No. 5	Mar.	2	..	0.89	0.03	0.03	0.22	0.05	0.06	0.22	0.03	indt.
		9	..	1.00	1.00	1.35	1.00	0.55	0.26	1.29	0.24	0.12
(Low		16	..	2.10	0.87	0.58	1.67	1.67	indt.	0.58	1.41	0.26
Density)	June	3	..	0.42	0.39	0.42	0.22	1.65	0.28	0.22	0.05	indt.
		10	..	0.70	0.39	1.48	0.33	0.52	0.70	0.70	0.33	indt.
		24	..	0.71	1.00	1.00	indt.	7.14	4.49	0.45	0.10	<0.01
Ohio River,	Jan.	5	..	3.77	1.31	1.77	3.77	0.54	0.17	13.08	0.08	0.06
Broadway		12	..	1.13	1.13	6.57	2.43	1.13	0.70	7.00	1.13	0.33
		26	..	0.61	0.61	0.61	1.18	0.18	0.06	1.18	0.12	0.18
(High	June	1	..	0.29	0.46	0.65	0.29	0.02	0.01	0.08	<0.01	<0.01
Density)		8	..	1.94	1.82	1.35	1.35	0.29	0.06	1.29	0.29	0.08
		15	..	8.46	2.54	3.77	0.61	0.25	0.18	2.54	0.06	0.10
				Ratios of Delayed MF Coliform Counts to Initial MF Coliform Counts								
Well No. 5	Mar.	2	..	..	..	..	1.03	0.83	1.53	1.00	3.00	2.33
		9	..	..	..	..	0.94	0.96	1.07	1.00	1.24	1.12
(Low		16	..	..	..	..	1.35	22.06	15.29	4.12	5.59	6.18
Density)	June	3	..	..	..	..	2.82	1.55	2.59	1.64	1.50	2.45
		10	..	..	..	..	1.34	1.53	1.47	0.66	0.75	0.80
		24	..	..	..	..	0.50	0.69	0.41	0.34	0.41	0.41
Ohio River,	Jan.	5	..	..	..	..	0.94	1.00	1.17	0.61	0.67	0.83
Broadway		12	..	..	..	..	1.24	1.57	1.43	1.28	1.19	0.79
		26	..	..	..	..	0.83	0.89	1.00	0.50	0.78	0.78
(High	June	1	..	..	..	..	0.59	0.70	0.96	0.33	0.44	0.48
Density)		8	..	..	..	..	0.63	0.70	0.87	0.47	0.43	0.57
		15	..	..	..	..	0.72	0.78	1.00	0.32	0.56	0.89
				Ratios of Delayed MF Coliform Counts to Initial MPN Coliform Counts								
			*									
Well No. 5	Mar.	2	0.08	..	..	..	0.08	0.06	0.12	0.08	0.23	0.18
		9	0.52	..	..	..	0.49	0.50	0.56	0.52	0.65	0.59
		16	0.44	..	..	..	0.59	9.52	6.67	1.79	2.44	2.69
(Low	June	3	0.28	..	..	..	0.78	0.43	0.72	0.46	0.42	0.68
Density)		10	1.79	..	..	..	2.39	2.72	2.64	1.18	1.33	1.42
		24	0.65	..	..	..	0.33	0.45	0.27	0.23	0.27	0.27
Ohio River,	Jan.	5	1.38	..	..	..	1.31	1.38	1.62	0.85	0.92	1.15
Broadway		12	0.83	..	..	..	1.03	1.30	1.17	1.06	0.99	0.66
		26	0.64	..	..	..	0.54	0.57	0.64	0.32	0.50	0.50
(High	June	1	0.16	..	..	..	0.11	0.15	0.05	0.07	0.08	0.08
Density)		8	1.76	..	..	..	1.12	1.24	1.53	0.82	0.76	1.00
		15	1.38	..	..	..	1.00	1.06	1.38	0.45	0.77	1.23

* Ratio of (initial MF/Initial MPN).

storage are brought out more clearly in Table 4. Within each set of storage conditions ratios from all sources and seasons were arrayed in order of magnitude and the median ratios determined. Because some ratios depart widely from unity (which would indicate equivalence of two results being compared) it is felt that the median offers a more rational expression of the central tendency than the mean. Further, use of the median offers the opportunity for using numerically indeterminate results in arriving at a final numerical value. It is recognized that use of a single expression does not take unusual results into account; its usefulness here is to offer "most representative values" for comparison of relative coliform counts under different circumstances.

The 95 per cent confidence limits of the median, also shown in Table 4, were determined according to the method given by Dixon and Massey.[14] These confidence limits further demonstrate the greater tendency of MF coliform counts to cluster about a central value than do the corresponding MPN counts. Inspection of the delayed MF to initial MF ratios (Table 4) makes it apparent that the upper limiting 95 per cent confidence value of the median is less than twice the lower limiting value in all but one case. In contrast, comparison of the storage MPN to initial MPN ratios shows that in all cases the upper limit of the 95 per cent confidence zone for the median is at least 2.3 times the lower limit and in one case the upper limit is 24 times the lower limit.

Use of the median ratios in comparing MPN values from stored liquid samples with initial MPN results confirms 5° C storage as the optimum condition for liquid samples. However, even under refrigeration, a drop in coliform count is common within the first 24 hours of storage. The median ratio of coliform count after 24 hours at

Table 4—Comparison of Median MPN Ratios of Stored Fluid Samples and of Delayed MF Count Ratios to Initial MPN (36 Samples)

	Comparison of Coliform Ratios From the Test Methods					
	Storage MPN to Initial MPN		Delayed MF to Initial MPN		Delayed MF to Initial MF	
Storage Conditions	Median Ratio	95 Per cent Confidence * Limits	Median Ratio	95 Per cent Confidence * Limits	Median Ratio	95 Per cent Confidence * Limits
5° C Storage						
24 hr.	0.72	0.50–1.13	....	.....	....	.....
48 hr.	0.53	0.39–1.00	....	.....	....	.....
72 hr.	0.54	0.37–0.85	....	.....	....	.....
Room Temperature						
24 hr.	0.63	0.29–1.00	0.53	0.35–0.79	0.94	0.83–1.06
48 hr.	0.23	0.12–0.55	0.54	0.35–1.08	0.98	0.81–1.33
72 hr.	0.09	0.05–0.17	0.56	0.30–1.08	1.13	0.93–1.47
35° C Storage						
24 hr.	0.25	0.10–0.63	0.43	0.23–0.65	0.66	0.47–1.00
48 hr.	0.09	0.01–0.24	0.42	0.31–0.76	0.77	0.67–1.15
72 hr.	0.04	<0.01–0.10	0.45	0.29–0.73	0.88	0.79–1.09

* The 95 per cent confidence limits of 36 medians are the 12th and 25th values when they are arranged in ascending rank.

5° C is 0.72 that of the corresponding initial MPN count and drops to 0.53 and 0.54 that of the initial count after 48 and 72 hours, respectively. A progressive reduction in coliform count occurs in the stored liquid samples regardless of the temperature of storage, progressing more rapidly at higher temperatures.

Storage of MF's at 35° C results in counts somewhat lower than at room temperature, but yet more in accord with the initial MPN than are secured by MPN from liquid samples stored at 35° C. Here, too, the coliform count is relatively stable, though only slightly lower than half that of the corresponding initial MPN value.

Comparison of the coliform counts from preserved MF's with the initial MF coliform counts shows that at room temperature and at 35° C the coliform counts tend to approximate the initial MF coliform counts. This is particularly true at room temperature, while at 35° C the median coliform count drops to 0.66 (at 24 hours) that of the initial MF coliform counts and gradually is increased with continued storage until the median count after 72 hours is 0.88 that of the initial MF count. These results demonstrate that while storage temperature does exert an effect on the coliform counts secured from preserved MF's, the variation is less than that observed in liquid samples stored at similar temperatures and examined by the MPN method.

A separate analysis of variance * was carried out on the data for each of the six sources of water samples. These analyses examined the independent effects of the various factors (temperature, storage time, method of estimating density, and date of collection), as well as the interactions between them.

As a preliminary step, within each source a 20 per cent random sample was selected of the sets of three replicate MF counts made at each dilution of a water sample. The means and variances of these selected triplets were computed and plotted on log-log graph paper. In every source the relation of log variance to log mean was clearly linear. Least squares analysis of these lines revealed an average slope close to unity (1.09) and an average intercept close to zero (–0.11) justifying the assumption that, on the average, the variance of the colony count approximately equalled the mean. This implied a Poisson distribution of replicate counts.

On these grounds the basic variable for analysis was chosen to be the square root of the estimated density, in order to stabilize the variance of the estimate and convert it to an approximately normally distributed variable. For ease of analysis this same transformation was applied to the MPN, although experience has shown the MPN to be log-normally distributed. However, both square root and log transformations are in the same "direction," that is, they tend to minimize a long tail in the distribution represented by high values of the variable. Further, the square root transformation offers no difficulties when applied to zero (or indeterminately small) density estimates.

The square roots of the three replicate plates at each sample dilution were then averaged. These dilution averages (two or three in number) were again averaged to produce a single mean estimated density of coliform organisms in a given sample of water. In the last averaging step the dilution averages were weighted, so that the highest dilution (i.e., that using the smallest sample volume) contributed least to the final average. The weight used was the square root of the dilution factor. For example, when 50 ml of sample were

* This section was prepared by Eugene K. Harris, analytical statistician at the Robert A. Taft Sanitary Engineering Center. The assistance of Alta E. Tolson, who performed the statistical computations described herein is gratefully acknowledged.

filtered, the dilution factor was one-half since all estimated densities were put on a "per 100 ml" basis. Hence, a weight of 0.707 was applied to the average at that dilution. Since separate analyses of variance were carried out for each source, the dilution factors and, therefore, the weights did not vary greatly within each analysis.

The main conclusions reached by these analyses were the same as may be obtained by inspection of Table 4, indicating the value of the simpler method based on the median ratios. The disadvantage of this method is that each median should be drawn from a fairly long series of ratios in order to achieve adequate precision. In the present work this necessitated combining seasons and sources. As noted in the discussion of Table 4, the effects of temperature and storage were not always the same on high- as on low-density samples. These differences were also revealed in the variance analyses. However, they were relatively minor and certainly not of sufficient importance to influence the conclusions drawn from Table 4.

Summary

A delayed incubation coliform test on membrane filters is described. This procedure is studied in parallel with MPN determinations on stored liquid samples and results from both were compared with results from an initial five-tube, three-dilution MPN test.

This comparison was made on samples from six sources, consisting of three rivers, two farm wells, and a lake. From each source three samples were examined in a winter and in a summer series. Storage of liquid samples was at 5° C, room temperature (13–32° C), and at 35° C for periods of 24, 48, and 72 hours.

MPN coliform counts made on liquid samples held at 5° C for periods up to 72 hours are quite variable, but more closely approximate the initial MPN results than do the counts from samples stored at 13–32° C or at 35° C.

Estimations of coliform densities in water by use of the delayed incubation MF technic at 13–32° C indicate good agreement with the MPN on stored samples at 5° C, but tend to be less than the initial MPN. The MF storage results at room temperature and at 35° C are superior to results of MPN procedures on liquid samples stored more than 24 hours at room temperature or 35° C.

The delayed incubation coliform test is suggested for field application where shipment of refrigerated samples cannot be made or during periods of natural or wartime emergency. This procedure consists of (1) filtration of sample at collection site; (2) placement of membrane on the preservative medium; (3) wrapping of individual Petri dishes in squares of "Parafilm"; followed by (4) unrefrigerated shipment to a laboratory for completion of the bacterial examination. It is necessary to maintain a saturated humidity over the membranes at all times (storage, transportation, and incubation periods).

Appendix (Media)

M-Enrichment Medium

Commercially prepared dehydrated M-Enrichment Broth (Difco) was used in these studies. The equivalent medium can be made as follows: Add 6.0 gm of yeast extract, 40.0 gm of proteose peptone No. 3, 5.0 gm of dipotassium hydrogen phosphate (anhydrous), and 5.0 gm of sodium chloride to 1 liter of distilled water. Heat until all ingredients are dissolved. Adjust the reaction so that the pH after sterilization will be 7.0. Distribute in the desired containers and sterilize in the autoclave at 15 lb. (121° C) for 15 minutes.

Endo Basal Medium

Add 20.0 gm of neopeptone and 7.0 gm of dipotassium hydrogen phosphate (anhydrous) to 1 liter of distilled water. Heat until all

ingredients are dissolved. Adjust the reaction so that the pH reading after sterilization will be 7.5. Filter the medium through coarse filter paper. Distribute it in 30 ml quantities to the desired containers and sterilize as above.

EHC Powdered Indicator

Grind 5.04 gm of basic fuchsin to a fine powder by means of a mortar and pestle. Add 12.60 gm of sodium sulfite (anhydrous) and grind thoroughly. Finally, add 122.40 gm of lactose gradually, continuing the grinding until a homogeneous mixture is obtained. Store the indicator in an air-tight container in a cool dry place protected from the light.

The composition of this indicator is based on the use of basic fuchsin having 95 per cent dye content and subjected to a dye titration as described in an earlier report.[10] Other lots of dye, having a different dye content, may require dye titration and adjustment of the amount of dye to be used.

Use of powdered indicator has in this laboratory superseded the use of solutions of lactose, sulfite, and basic fuchsin in the preparation of finished EHC Endo medium. Advantages attributable to its use are increased stability of the indicator substances, economy of time and effort in preparation of medium, and a tendency toward greater uniformity of the finished medium.

Preparation of Finished EHC Endo Medium

Add 0.6 gm of EHC powdered indicator and 1.0 ml of ethanol (95 per cent) to each 30 ml tube of sterile Endo basal medium and mix thoroughly. Sufficient medium (1.8–2.2 ml) is dispensed to saturate each nutrient pad.

Preparation of Preservative (Benzoated Endo) Medium

This medium is prepared by adding 1.0 ml of 12 per cent aqueous sodium benzoate solution (without sterilization), 0.6 gm of EHC powdered indicator, and 0.7 ml of ethanol to 30 ml of Endo basal medium. It is mixed thoroughly and dispensed to nutrient pads as above.

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The President's Rehabilitation Program —A Symposium

KENNETH E. POHLMANN

Briefly but revealingly presented here is the essence of a thoroughgoing discussion of the newer aspects of the rehabilitation services for the handicapped. Especial consideration is given to the aspects of the program that, more and more, are becoming accepted as an integral part of public health administration.

Agencies and personnel concerned with public health should have a working knowledge of the current developments in the field of rehabilitation. Particularly is this true of the effects of the new legislation which increased federal participation in the training of personnel and construction of facilities. The federal program also emphasizes new approaches to the problems of the medically indigent and the physically handicapped.

The four papers of the symposium, each representing an approach to the subject matter from the point of view of a particular agency or discipline, lend themselves to a convenient breakdown for presentation in condensed form. Dr. Joseph Gerber's paper, "The Public Vocational Rehabilitation Program," reviews briefly the history of the federal-state vocational rehabilitation program, including the 1954 Amendments to the Vocational Rehabilitation Act (Public Law 565). He points up the complexity of the rehabilitation process and the multiplicity of services needed to carry it out effectively. As he sees it, this will demand a high degree of community planning and organization, a prime requisite if the objectives of the expanded federal-state vocational rehabilitation program are to be met. Several excellent charts and tables supplement Dr. Gerber's paper which serve to illustrate the expanding role of this significant program for the physically handicapped since 1944—the year in which the first substantial amendments were made to the original Act of 1920.

Types of disability of persons rehabilitated in 1945 and 1953 by the federal-state program are given in a table (reproduced here). From this data it is evident that not too many significant changes have occurred in the types of cases served by this program during the period except in certain areas. Tuberculosis accounted for 6.3 per cent of the cases in 1945, and for 10.2 per cent of cases in 1953. The blind ac-

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Mr. Pohlmann, who is associated with the United Mine Workers of America, Welfare and Retirement Fund, Washington, D. C., is the author of this condensation of the four papers which were presented before the Medical Care Section of the American Public Health Association at the Eighty-Second Annual Meeting in Buffalo, N. Y., October 13, 1954.

The authors of the papers are: John W. Cronin, M.D., F.A.P.H.A., chief, Division of Hospital Facilities, Public Health Service, Washington, D. C.; Catherine A. Worthingham, Ph.D., director of professional education, National Foundation for Infantile Paralysis, New York, N. Y.; I. Jay Brightman, M.D., F.A.P.H.A., assistant commissioner, State Department of Social Welfare, Albany, N. Y.; and Joseph H. Gerber, M.D., F.A.P.H.A., chief medical officer, Office of Vocational Rehabilitation, Department of Health, Education, and Welfare, Washington, D. C.

Type of Disability of Persons Rehabilitated in 1945 and 1953

Type of Disability (at acceptance)	Persons Rehabilitated			
	1945 *		1953	
	Number	Per cent	Number	Per cent
Total	41,925	100.0	61,308	100.0
Impairment, Extremities				
Upper	2,691	6.4	2,399	3.9
Lower	7,414	17.6	8,247	13.5
Combination, Upper-Lower	1,507	3.6	2,123	3.5
Impairment, Back	2,419	5.8	4,047	6.6
Impairment, Chest, Neck, Head	312	.7	537	.9
Amputation or Congenital Absence, Extremities				
Upper	2,157	5.2	1,762	2.9
Lower	4,168	10.0	5,398	8.8
Combination, Upper-Lower	55	.1	70	.1
Tuberculosis, Pulmonary	2,651	6.3	6,241	10.2
Blind	1,497	3.6	3,685	6.0
Other Visual	3,448	8.3	3,770	6.1
Hard of Hearing	2,097	5.0	3,293	5.4
Deaf	1,023	2.4	1,068	1.7
Cardiac	1,784	4.3	2,649	4.3
Mental or Nervous System Diseases				
Epilepsy	318	.8	1,134	1.8
Psychopathic Personality	71	.2	145	.2
Psychosis	55	.1	609	1.0
Psychoneurosis	1,230	2.9	1,329	2.2
Mental Deficiency	106	.3	573	.9
Other	649	1.6	324	.5
Speech	252	.6	793	1.3
Facial Disfigurement	111	.3	394	.6
Dwarf	66	.2	83	.1
Other	5,708	13.7	10,635	17.5
Not Reported	136	†	0	0

* Not available for 1944
† Not included in distribution

counted for 3.6 per cent of cases in 1945 and for 6 per cent in 1953, but no substantial increases were noted in those handicapped areas now being stressed—the cardiac group and the groups with mental health problems. This serves only to emphasize the need for communities to evaluate their problems of physical disabilities and to integrate and coordinate their health and welfare services in such a manner as to meet needs more effectively—a point strongly urged by Dr. Gerber, in utilizing expanded funds and services available in the new program.

Dr. John Cronin, in describing the Hill-Burton Amendments of 1954 to the Hospital Construction and Survey Act, also points out the necessity for community planning giving special consideration to the ways and means of achieving "interprofessional functioning" in the

development of state plans to meet the need for chronic disease facilities, nursing homes, diagnostic and treatment centers, and rehabilitation facilities. As he suggests, the act with amendments, has "important implication for (1) interprofessional collaboration and performance; (2) community health planning; and (3) for health promotion and chronic disease control." Whether or not these three ingredients can be properly mixed and served up in palatable form will again, as he indicated, depend upon full understanding of the problems in a given community, the resources already available to cope with them, plus a willingness to round out available resources and services to provide ways and means of meeting them more completely. The road charted is not an easy one, but the road already traveled in the hospital survey and construction efforts to date, as Dr. Cronin indicates, has given us a wealth of experience and "know-how" which can serve as a valuable guide.

Dr. Catherine A. Worthingham, in her paper, entitled "Manpower Implications of the President's Rehabilitation Program," warns us that the benefits of the accelerated program possible through the new legislation will depend upon the availability and effective use of many types of trained personnel. "Herein lies the dilemma"; says Dr. Worthingham, "how to extend the services of existing personnel; how to secure and provide training for additional personnel; and how to do both without lowering the quality of patient care." She further states, "Many attempts have been made to define the term 'rehabilitation.' Although it is fascinating to analyze the multiple interpretations which have been given, it will serve no practical purpose to review them in detail in this brief consideration of a complicated problem. It should be sufficient to say that rehabilitation is total patient care not, as so often stated, total or comprehensive medical care. Many elements of a successful rehabilitation program are not medical in character, although they must be utilized in correct relationship to the medical care program for the patient."

Again, she says, "If then, rehabilitation is total patient care, what kinds of personnel and facilities are needed to carry out such a program? The types of personnel used for patient care have also increased since the horse and buggy days of the practice of medicine. From the doctor and nurse the group has expanded until there are now over a hundred classifications of health occupations, not all of course requiring professional training, but all essential to a comprehensive approach to the patient care needs of the nation. As far as total numbers are concerned, it should be noted that the 1950 census showed that physicians-surgeons and scientists made up only about one-tenth of the country's total health personnel. It is apparent that this is an era of the team approach to patient care, whether or not it is recognized or desired by the medical profession."

With this provocative introduction to her paper, Dr. Worthingham then goes on to describe some of the areas which need to be clearly defined if we are to achieve our goals in rehabilitation. She supports, essentially, the same thesis developed by Dr. Gerber and Dr. Cronin, namely, that the community needs to (1) know the extent of its problem, (2) the resources available for solving it, and (3) what additional services are needed to accelerate the solution. She emphasizes the need for orientation of existing facilities, as well as present personnel, to the newer concept of total patient care implicit in the rehabilitation process. The need for more personnel, as she points out, is obvious, particularly in physical therapy but she also states that the better utilization of existing personnel, at professional

levels, is an imperative necessity. She also challenges the professional groups to make better use of nonprofessional personnel and cites, as supporting evidence, the role of the Nurses Aid Training Project in the field of nursing care and the proposals of the American Physical Therapy Association with respect to the use of nonprofessional personnel in a physical therapy department.

With respect to additional personnel, she says, "The immediate need for personnel expressed in terms of proportional increase then, is 14 per cent for nurses, 41 per cent for physical therapists, 72 per cent for occupational therapists, 30 per cent for medical social workers, and 41 per cent for vocational rehabilitation counselors."

On student recruitment she has this to say, "It is influenced by many factors, notably: (1) the total number of persons in the age group from which each student group is sought; (2) the attitudes of the general public and the immediate associates of the prospective student toward the particular field of employment; (3) the opportunity for a satisfying life experience; (4) the personnel policies and salary ranges of the employing institutions; (5) the opportunity for professional advancement; (6) the available sources of financial assistance to students; (7) the amount of pressure which can be exerted through technics and media of public communication and the availability of funds to pay for their use; and (8) the ability of the group concerned to present the field as an interesting and stimulating career."

She concludes by stating, "To expand the use of the team concept inherent in rehabilitation, a balance must be maintained in the numbers of the kinds of personnel required to give these services. This same balance must be reflected in the development of training facilities and the emphasis on student recruitment. To bring out this point a comparison of existing personnel and estimates of immediate need for additional personnel is presented in round numbers for five fields essential to rehabilitation: nursing, physical therapy, occupational therapy, medical social work, and vocational rehabilitation counseling. There are 350,000 practicing nurses and an immediate need for 50,000 more; 6,000 physical therapists and a need for 2,500; 4,000 occupational therapists and a need for 2,900; 3,300 medical social workers and a need for 1,000, and 1,200 vocational rehabilitation counselors and a need for an additional 500."

Since this paper was delivered, the Federal-State Vocational Rehabilitation Program has made extensive grants for teaching facilities and the like directed toward meeting manpower needs. Whether or not the basic philosophy expounded by Dr. Worthingham has been recognized in this effort would be an interesting subject for another paper at some future session.

Dr. I. Jay Brightman in his paper, "The President's Rehabilitation Program: Social Security Aspects," reviews the OASI program to date, and comments upon the effect the new amendments to the act may have upon rehabilitation efforts as well as future problems in the field of dependency and medical indigency. He summarizes a scholarly presentation with these remarks: "The increase in benefits available under the Old Age and Survivors' Insurance Program and the extension of the program to include large new groups of persons will go far to minimizing emotional instability, stress problems and consequent maladjustment attributable to financial insecurity. The provisions for preservation of the benefit rights of disabled persons should stimulate interest in the rehabilitation of these individuals whenever that is possible. Eventually, the amendments may play a vital role in reducing in-

stitutionalization of older persons for mental or physical disease.

"The federal legislation in the program of Aid to the Permanently and Totally Disabled enacted four years ago, has done much to stimulate local agencies in the evaluation of their clients and to increase the referral of clients to rehabilitation services. It may well set the pattern for the OASI program concerning the disabled. The expected increase in diagnostic and rehabilitation centers under the Hill-Burton amendments and the extension of the vocational rehabilitation services should aid both programs considerably."

He concludes his statement with a quotation from the statement on the essentials of public welfare, approved by the American Public Welfare Association in November, 1952.

"No condition is as costly in terms of individual, social, and economic loss as ill health and disability. Public welfare is, therefore, concerned with the advance of medical knowledge, the availability of health facilities in personnel, and the extension of public health services. Moreover, in order to assure an optimum standard of health and restore to good health those suffering from illness or impairment, the benefits of modern medical science must be available to all. To the extent that individuals cannot secure it for themselves, governmental and other social measures should assure its availability."

It is evident from these four papers, that new ideas and new thinking are going on in the fields of public health and welfare—that the concept of rehabilitation, broadly interpreted, is permeating every phase of health and welfare activity. To the informed in these fields, it has implications that cannot be ignored. To those who are unmoved, a conversation overheard by the reviewer between a banker and an industrialist at a recent NEPH Week Meeting is illustrative. Said the former to the latter, "we need resistance to assistance but support for rehabilitation—it makes sense."

"A health department which devotes itself exclusively to service risks inadequacy and mediocrity. A department that carries on demonstrations and field studies, constantly applying the knowledge derived from research, improves all its functions and makes more effective all its services. Furthermore, a health department that includes teaching among its activities, in addition to service and research, is certain to provide the highest quality of public health and preventive medicine. Such a department attracts the best personnel and holds them. With greater ease it gains understanding of the various groups that contribute to the public health of a community; it can provide the leadership and guidance that can be given only by workers who are keenly concerned about the social and economic aspects of community health. Such workers are more than just members of the public health professions; they are specialists in community well-being. Tomorrow looks bright because of the working partnership of service, research, and teaching in public health."

(From "Where Are We Going In Public Health" by Herman E. Hilleboe, M.D., state commissioner of health of New York, presented at the First General Assembly of the 30th Annual Meeting of the Texas Public Health Association, Galveston, February 14, 1955.)

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First National Conference on Evaluation in Public Health

Consciously or subconsciously evaluation is an inseparable part of human life and one of the characteristics that distinguishes the behavior of the cerebrating homo sapiens from the instinct-guided, reflex-conditioned behavior of the lower forms of animal life. Objective, critical, self-evaluation is said to be a hallmark of the emotionally mature adult.

Evaluation is not new in public health. It predates Lemuel Shattuck's report and probably also predates biblical references to public health. One cannot plan or administer a public health program properly without evaluating it; thus one of the primary objectives of the Committee on Administrative Practice of the American Public Health Association is the evaluation of administrative procedures. Although evaluation is not new, methods and tools of measurement change as do attitudes toward, and emphasis on, evaluation. Thus it is timely in an age when we can measure the energy released by synthetic nuclear fusion to renew our efforts at measuring the accomplishments of our public health programs.

It is against this background that we welcome and salute the First National Conference on Evaluation in Public Health held at the University of Michigan School of Public Health at Ann Arbor last September 12th and 13th.

Developing as a result of a resolution by the Association of State and Territorial Health Officers in 1953, this conference was sponsored by the American Public Health Association, the Association of Business Management in Public Health, the Association of State and Territorial Health Officers, the Children's Bureau and the Public Health Service of the U. S. Department of Health, Education, and Welfare, in cooperation with the School of Public Health of the University of Michigan. It assembled under one roof scores of outstanding persons in the various public health professions, most of whom had demonstrated special competence in the field of public health evaluation. They included persons from areas scattered from Ottawa to Louisiana and from the east coast to the far west of the United States. All told, 112 persons expended the time and funds to attend this conclave. The conference included members or directors of many of the prominent state and local health departments, as well as persons from national, official and voluntary public health agencies and from several schools of public health and medical schools.

The assembly was well organized and run in such a fashion that each of the participants had occasion to enter into active discussion through one of five con-

current subgroups. The planning committee had arranged in advance to furnish the moderator and discussion leaders of each of these groups with a common outline that would serve as a uniform frame of reference. This outline attempted to form a structural common denominator into which one could place the basic items of program objectives and program procedures, as well as methods of evaluation of both the objectives and the procedures.

Five sample public health "programs" were selected to illustrate the possible use of such a framework and to serve as a discussion base to work out the over-all scheme and to afford a jumping off point for future recommendations in the field of program planning and evaluation. The sample programs selected were accident prevention, cancer control, fluoridation, premature care and tuberculosis control. After two days and two nights of formal and informal deliberations, a plenary session was held at which a summary of the discussions was aired and recommendations considered for future action.

Four specific recommendations eventuated and were unanimously adopted. They were:

1. That a committee be appointed to develop uniform terminology and nomenclature for use in discussing and planning evaluation procedures.

2. That persons associated with each of the agencies present at the conference plan to evaluate at least one aspect of their programs or objectives during the coming year.

3. That a second conference be held about a year after the first at which one of the functions should be a summary of reports on the evaluation projects carried on as a result of the second recommendation above.

4. That a national clearing house and repository of information for evaluation in public health should be established under the jurisdiction of the Committee on Administrative Practice of the American Public Health Association.

We believe this conference represents an excellent additional step along the road to objective and comparable evaluation. Too much of what has passed for evaluation in the past has been subjective and insufficiently documented to permit comparison with other programs elsewhere, or even with the same program at different times. We congratulate the planning committee, the University of Michigan School of Public Health, and the participants in the First National Conference on Evaluation in Public Health on what we believe is a firm and noteworthy step in the right direction.

The Geneva Conference on Peaceful Uses of Atomic Energy

International conferences are so characteristic of our times that one more may stir up little or no excitement, except for the fact that the August, 1955, Geneva conference dealt for the first time in history with atomic energy. The magic words "atomic energy" distinguish this meeting from any other previously held, because a tense world dramatically fears and hopes to benefit from the revolutionary possibilities of the great discoveries of the mid-twentieth century.

This conference had especial significance in that over 70 countries participated; that political implications were nonexistent; that technical promises for the future in medicine, biology, and industry were elaborated for a peaceful use; that almost

millenia for power production were hinted at and even promised; and that scientific material was released in large amounts from the restraints of security. The scientists participating gave an impression of exhilaration in being permitted once more to meet and talk with their peers from almost every country in the world. Not all was disclosed, but far more than anyone had supposed would see the light of day.

No small part of the plenary and special sessions concerned themselves with the applications of nuclear energy to biology, medicine, and wastes. Protection of public and worker against ever-present hazards of production, of use and of the potentialities of accident were discussed in many sessions with frankness and with reassurances to the man in the street. Even the unsolved problems were clearly spelled out to challenge the investigator. The promises and hopes for industrial applications likewise consumed much time for presentation. The exhibits of instrumentation, of medical application, of industrial and research use by the United Kingdom, Canada, France, USSR and the United States were superb. Thousands of laymen paraded through these, day by day, enthralled by this new world.

Although myriads of problems were posed in the field of public health interest and responsibility, the health officer was conspicuous by his absence at this epoch-making international conference of the twentieth century.

Help in Starting Medical Practice

The Sears Roebuck Foundation is making available 10-year unsecured loans of up to $25,000 to physicians who seek to establish practice, but are unable to get full local financing. For the first experimental year, $125,000 has been allocated for at least one loan in each of five regions of the country.

Applications are considered on the basis of need, expected use of the funds, and the applicant's own effort in understanding and solving his problem. He must furnish information about the prospective area of practice, the need for medical care, existing medical resources, benefits to the community expected, and the conditions making for a successful practice. Applications are screened by a Medical Advisory Board appointed from nominations made by the Board of Trustees of the American Medical Association, which is cooperating in the plan chiefly through physician placement offices of state medical societies. Chairman of the Advisory Board is F. J. L. Blasingame, M.D., Wharton, Tex.

Applications should be sent to the office of the region in which the proposed practice is to be established. Director, Sears Roebuck Board, Pacific Coast-2650 Olympia Blvd., Los Angeles 54, Calif.; Southwest-1409 So. Lamar St., Dallas 2, Tex.; Midwest-8 E. Congress St., Chicago 5, Ill.; South-675 Ponce de Leon Ave., Atlanta, Ga.; East-4640 Roosevelt Boulevard, Philadelphia 32, Pa.

Clearing House on Public Health Salary Information and Personnel Needs

Nursing Recruitment Up to Date

The National League for Nursing, through its Committee on Careers, in a recent News Letter (August 30) brings recruitment groups up to date on the current outlook for nurse students. At the end of August, 42,000 students had been admitted or accepted for 1955 and nearly 10,000 applications for fall classes were still pending. Present indications are for 47,000 admissions in 1955, 5 per cent more than in 1954 and the largest increase since the war years.

Admissions to schools of practical nursing also appear to be on the increase; the 400 schools are ready to admit 18,600 students, had admitted nearly 11,000 at the end of June, with nearly 10,000 further applications to consider.

But the chairman of the committee, John H. Hayes, reminds recruitment workers of their responsibilities beyond getting students into schools. Says he, "What happens to applicants who are not admitted to schools of professional nursing? Are they referred to other schools whose quotas are not filled? Has your state and local careers committee set up a referral system so qualified candidates may reach schools with vacancies? Are applicants counseled carefully so that those qualified for other health careers are not lost to the health field? Are they made to understand why they cannot be admitted to professional nursing so that they remain friends of the profession?" These are responsibilities that apply as well to recruitment workers in the other public health disciplines.

Recruitment on a Regional Basis

"Do You Have What It Takes?" is a basic recruitment leaflet of the American Association of Medical Social Workers (now a section of the National Association of Social Workers). Its front and back cover contain basic information about medical social work. The inside of the leaflet, however, is designed to meet the special situations of the various districts into which the association divides the country.

Coming out recently is what is called a fifth edition prepared especially for the Middle Atlantic district. It includes pictures and a story from the Philadelphia Sunday Bulletin entitled "Medical Social Worker a Vital Link in Care of Many Sick and Aged Here." In one brief page it manages to describe a number of situations in which the social worker operates, what variety of agencies employ social workers, the two Pennsylvania schools for training them, the extent of vacancies, and salaries.

Shortly to be released is a sixth edition in preparation for the North Atlantic district. This will be beamed specifically toward the undergraduate to stimulate interest in social work as a career.

Insurance Company Aids Recruitment

"Should Your Child Be a Dentist?" is 16th in a series on career opportunities for young men and women presented "in the public interest" by the New York Life Insurance Company. The articles are in the form of six annual two-page advertisements in such national magazines as the Saturday Evening Post, Ladies Home Journal, Colliers, Life, and others. Among earlier ones have been one each on medicine, chemistry, nursing, pharmacy, and public service.

The latest one was prepared by Philip E. Blackerby, Jr., D.D.S., chair-

man of the Council on Dental Education of the American Dental Association, and director, Division of Dentistry, W. K. Kellogg Foundation. This is a reasoned, down to earth statement of what the life of a dentist is, his education, earnings, satisfactions, professional status, but it also indicates the kind of personality required and the kind that should stay out of dentistry. Dr. Blackerby does a particularly good thumbnail history of dentistry from its tooth-pulling days to the present mouth hygiene days.

Each of these articles, as well as an article on "The Cost of Four Years at College," has been reprinted in booklet form and is available from the New York Life Insurance Company, 51 Madison Ave., Department 16-P, New York 10, N. Y. Free.

Sanitary Engineering Satisfactions

The American Society of Civil Engineers has published the report of a survey on "Sanitary Engineers—Their Earnings and Professional Attitudes." More than one-half of the 2,189 members of the Sanitary Engineering Division who received questionnaires replied. Among the items covered by the survey are salaries, professional satisfactions, educational training, type of engineering work, and employing agency.

In general the sanitary engineer reported that he was satisfied with his career as a whole and with his present position. More than a third reported that their salaries were unsatisfactory, and nearly a fourth were not satisfied with "professional recognition," a term undefined in the questionnaire.

Nearly half of those reporting were employed by federal, state, or local government, 40 per cent by consulting engineer firms. As to type of work, one-third were engaged in technical design, one-fifth each in management and public health, fewer than 2 per cent in research.

Salaries are analyzed in terms of years of experience. As to salaries the study says, "The bulk of sanitary engineers who are employees and technical designers for the most part appear to be receiving income somewhat below those that might be expected for the training, degree of competence, and productivity demanded of them. It is suggested that this condition is becoming known and is a basic cause of the reported decrease in interest in sanitary engineering as a professional career." Paper No. 773, Proceedings, American Society of Civil Engineers (Aug), 1955. 33 W. 39th St., New York 18, N. Y. 50 cents.

New York City Has a Salary Plan

After study of more than a year, the Career and Salary Plan for New York City's Department of Health has been put into effect. Its outstanding features are described as "the first real career and salary plan for medical officers and clinic staff . . . a career plan for public health, including a sound basis for recruiting graduate nurses . . . recognition of equality between the dental and medical services, laboratory and scientific service set-up as a career service, sound recruiting salary for inspectional staff, and clerical salaries to meet those in private industry."

The Career and Salary Plan with salary ranges for 32 separate grades is published in the July issue of "Inside Health," the monthly publication for employees of the department. 125 Worth St., New York City.

Credit Lines

The Journal cannot furnish copies of items mentioned in Credit Lines. Please send requests to the addresses given.

Meeting the Emergency Quickly

Following the catastrophic floods of August 18–19 in Connecticut, the Connecticut State Department of Health staff was mobilized for 24-hour duty on an emergency basis at 5:40 A.M., August 19. A few days later material already prepared for the September "Health Bulletin" was put aside for a "disaster emergency issue" devoted chiefly to advising the public on drinking water, food, disinfection, typhoid immunization, shore bathing waters, emergency meals, and in general how to clear up after the flood. It outlines further the public health problems encountered and the emergency steps taken to meet them.

This is a detailed story of how an emergency was met quickly. Its recital should be of value in future crises in the state and elsewhere. Nor does the bulletin forget to thank everyone who helped—voluntary agencies, press, radio, telephone operators, plane pilots, and "many, many others." Dr. Osborn, the health officer, and his staff are to be congratulated for rising to the emergency.

Dental Health and Grooming Units

The Products Division of the Bristol-Myers Company has prepared new materials on dental health and personal grooming. Included are two dental health units, for grades 1–6. One is a film strip "Brush Up on Your Teeth," along with a teacher's manual, a demonstration toothbrush kit, and individual leaflets for each child; the second is "Working Together for Better Dental Health" with wall chart, manual, toothbrushing model, and individual leaflets. The latter is also designed for teen-agers and adults and can be used among employee groups.

Two grooming units are planned respectively for teen-agers and adults, particularly workers. The first, "Better Start With Good Grooming," has a wall chart, teacher's manual, poster, and leaflets, the latter separately for boys and girls. The adult program has a wall chart "Whatever Your Job Good Grooming Counts" with separate leaflets for white collar workers and service employees.

Educational Service Department, Bristol-Myers Products Division, 630 Fifth Ave., New York 20, N. Y.; free.

Sickness Insurance in Small Firms

Students of voluntary health insurance have found that providing coverage for employees of small business enterprises is a major problem. This is further confirmed by "Health and Welfare Plans in New York State" a recent study of the state's Department of Labor. This study found that concerns having fewer than 20 workers offer hospitalization insurance to fewer than one-third of their employees. In contrast establishments operating with 1,000 or more workers offer hospitalization benefits to 81 per cent of their employees. Other benefits studied—surgery, life insurance, pensions, accidental death, and dismemberment insurance—show equally great disparity between the offerings of small and large employers. The firms with fewer than 20 workers constitute 83 per cent of all establishments but employ only one-fourth of all workers; those with 1,000

or more workers, although making up less than 1 per cent of all concerns, also employ one-fourth of all workers.

Of the various health and welfare benefits provided by the nearly 185,000 industries, hospitalization coverage is offered to about 61 per cent of the four and a half million workers; surgical care coverage to 57 per cent; and medical care to 32 per cent.

The methodology of this mail questionnaire study is promised in a later report.

Special Labor News Memorandum No. 57, 1955, New York State Department of Labor, 80 Centre St., New York, N. Y.

Portland Fluoridation Recommended

A committee of the Portland (Ore.) City Club, after a two-year study, early in 1955 recommended the fluoridation of the water supply of metropolitan Portland as a public health measure. This recommendation was made on the basis of "the overwhelming weight of dental, medical, and other scientific opinion" which "confirms fluoridation of public water supplies as a safe and economic way of cutting the incidence of dental caries by at least one-half."

This is an excellent example of leadership by a civic agency in promoting understanding of a local issue. It could well serve other communities to make the fluoridation issue understood and to meet the arguments of those opposing fluoridation.

Report on Fluoridation of the Public Water Supply. May be purchased from the City Club of Portland, Ore.

70 Per cent Return to Work

The June American Journal of Public Health (p. 841) reported on a rehabilitation project for paraplegics set up in Boston by the Liberty Mutual Insurance Company in collaboration with a local hospital and medical school. Now comes the annual report of the company which gives figures for the entire rehabilitation service of the company. It operates two rehabilitation centers, one in Boston, established in 1943, another in Chicago operating since 1951. At the two centers, nearly 3,600 disabled workers have undergone rehabilitation; 86 per cent have been improved by treatment and 70 per cent have returned to work.

The company has made a movie of the activity at the Boston Center. "A Place for Courage" shows graphically what rehabilitation can do for the disabled. The film is being distributed to television stations nationally under the sponsorship of the President's Committee on Employment of the Physically Handicapped.

Latest in Health Centers

The Architectural Record, carrying out an earlier practice, published in the August, 1955, issue one of its Building Type Studies on "Public Health Centers." Articles by Surgeon General Leonard A. Scheele, John W. Cronin, M.D., chief of the Public Health Service's Division of Hospital and Medical Facilities, and R. M. Atwater, M.D., and an article on Planning the Public Health Center are supplemented with the description of three basic types of health centers and description of seven health centers and four group practice offices from South Carolina to Washington. Reprints (Building Types Study, No. 225) are available from the Division of Hospital and Medical Facilities, Public Health Service, Washington 25, D. C.

Regional MCH Seminar

The Bureaus of Maternal and Child Health in the State Health Departments of Florida, Georgia, and South Caro-

lina, with the Maternal Welfare Committee of the Florida Medical Association, sponsored the fifth annual tri-state Obstetric Seminar in Daytona Beach in September. Here about 300 physicians from the three states had an opportunity "to hear of the new developments in this field from recognized authorities. . . . Doctors stand to gain much from these sessions, but the real beneficiaries are mothers and infants."

A Cleft Palate Film Wins Top Prize

The Wisconsin Cleft Palate Story, a 16 mm film prepared by the University of Wisconsin, won second prize in the medical-surgical category at the Venice Film Festival during the summer of 1955. It was one of two United States films among the 73 entries submitted by the Film Council of America that were awarded prizes.

Alcoholism Is the Target

"Target" is a new publication of the Pennsylvania Department of Health. The "target" is prevention of alcoholism and the arrows are research, education, and rehabilitation. Prepared by the Division of Alcoholic Studies and Rehabilitation, this first issue (June, 1955) outlines its purpose as "to provide inspiration, stimulation, and information to lay and professional people throughout the Commonwealth of Pennsylvania that will enable them to: recognize alcoholism as a disease, take the initiative and plan a constructive control program, and mobilize resources and establish facilities on the local level necessary to prevent alcoholism in all of its various phases."

In addition, the division has recently published two useful pamphlets—"Counseling Centers for Alcoholism Offer Help" which includes a list of the six in the state and "Alcoholism: Its Prevention by Research, Education, Rehabilitation." Each of these sets out to help the wives, husbands, parents, friends, and the patient himself to understand alcoholism and to make use of available resources.

Adding Life to Years

"Notes for After Fifty" is a series of six letters to employed persons over 50 to help them with the problems of approaching retirement. Published by the National Association for Mental Health, they are being distributed through industry, trade unions, and organizations. A wide range of topics is included: health, the chances of remaining useful and busy, how an older person can make the most of his abilities, opportunities for work and play, money matters, and whether older people can fit in comfortably with younger ones—including their own children, and into the community as a whole. The letters are designed for mailing a week or two apart to those in the near retirement age.

National Association for Mental Health, 1790 Broadway, New York 19, N. Y., or state and local health associations.

More Than a Million Persons a Day

Each year the Administrators' Guide Issue of Hospitals presents, in numbers, the story of hospital utilization, finances, services, and personnel. In addition, this issue is a ready source of information about hospital organizations and many other associations, agencies, and schools in the health field. A series of selected management guides completes the report. The 1955 issue is the story of 6,970 hospitals with over a million and a half beds serving an average of more than 1,300,000 persons daily. More than 20 million persons were admitted to hospitals last year at a cost of more than five billion dollars.

With the termination of the American Medical Association registration and listing of hospitals in 1954 this issue contains the only listing of acceptable hospitals in the United States and Canada. Lists of approved Blue Cross and Blue Shield Plans are also included.

Of special interest to public health is the report on the routine use of selected diagnostic tests on all patients admitted by certain hospitals. There is evidence that a large job is still to be done in convincing the public, physicians, and hospital administrators of the preventive medical value and disease control significance of these measures. For example, fewer than one-third of all United States hospitals routinely x-ray the chests of all patients admitted.

Hospitals, 29:8 (Aug.), 1955, Part II Administrators' Guide Issue. American Hospital Association, 18 E. Division St., Chicago 10, Ill.

Why Not Use the Building Code

"Defending 'The Hill' Against Metal Houses" is the chronological account of a civic commotion in New Haven, Conn. In February, 1953, two junkmen obtained a license from the building inspector to construct a low-rent housing project on a rat-infested dump in a combined residential and industrial district known as "The Hill." Trouble started a month later when an irate resident, "a spinster with an overactive thyroid," took up the matter with her alderman, an unknowing and completely inexperienced novice serving his first term. The account ends just after the fall election with the case in the courts but never expected to come to trial. In between, not only political shenanigans were involved but race prejudice, snobbery, religious intolerance, long-standing grudges against Yale University, juvenile delinquency, and vandalism. In the entire cast of characters, which included prominent citizens and organized groups as well as ambitious politicians, there were few pots that could sneer at kettles. "The Hill" was spared the unsuitable metal houses, previously used for seven years as a "temporary" veterans' housing project in Queens, but not because of the adequate Building Code and Housing Ordinance.

This report is the 26th in a series of case studies to be used "as aids to the teaching and practice of public administration and policy formation." One can only conclude that it is an object lesson on how policy should not be formed.

The author is William K. Muir, Jr. Published for the Inter-University Case Program by Alabama University Press, University, Ala.; 50 cents.

A New Rehabilitation Publication

The National Tuberculosis Association with the August issue began the periodic, probably quarterly, publication of "Rehabilitation Events." It announces that "it is intended for staff and board members of state and local official and voluntary agencies and institutions, and for other groups or individuals . . . concerned with the rehabilitation of tuberculosis patients."

The four pages of the first issue summarize a surprising amount of information about a variety of rehabilitation programs in a variety of settings.

"Rehabilitation Events" is being distributed through state and local associations, except that national agencies may request it from the National Tuberculosis Association, 1790 Broadway, New York 19, N. Y.

Community Health Concerns Everyone

"Community Health in Action" is a new 16 mm sound film in color presenting the need for everyone in a community to join forces to get the best

possible health for themselves and their families. It was produced by Sam Orleans and Associates of Knoxville, with the cooperation of the National Health Council. The film shows real life men, women, and children in real life situations. Running time is 22½ minutes.

The film is adapted to a variety of uses, to build up support for official health departments, to point up the role of voluntary health agencies, to strengthen or create health councils, to stimulate young people to choose health careers, among others.

Sam Orleans and Associates, 211 W. Cumberland Ave., Knoxville, Tenn. $170 in color; $85 in black and white.

Annual Reports

"Chat-O-Hamiltons: A True Story of the Hamilton Family, 1954" is the annual report of the Chattanooga-Hamilton County Health Department, Tenn. It's a small folder of a few pages, with simple humorous illustrations and a minimum of text. In chatty story form, it tells how the health department affects the lives of the typical Hamilton family. Each page includes a few statistics. Paul M. Golley, M.D., M.P.H., is the health officer and his Hamilton family includes some 210,000 persons.

"Profile of a Year" is the 1954 annual report of the Quincy (Mass.) Health Department. It's a new kind of report. The various activities of the department are reported in chatty little stories about people—nutrition, chest x-rays, child health clinics, school health, mental hygiene—each with a separate chapter and catchy chapter headings. From A to Z details all the things a health officer does from administers to Z—etetic which translates to "seeks the source of infection in cases of scarlet fever, meningitis, etc." But you'll have to go to some other document to find who the health officer is. 1120 Hancock St., Quincy 69, Mass.

"Tribute to a Health Officer" is the 1954 annual report of the Montgomery County, Maryland Health Department. More than that, it is a review of the 22-year administration of V. L. Ellicott, M.D., as county health officer. Dr. Ellicott resigned in mid-1954 to become chief, Division of Chronic Disease Hospitals, Maryland Department of Health.

During the 22 years of Dr. Ellicott's administration, the county changed from a largely rural county to one of Washington's bedrooms, more than quadrupled in population, and radically changed the focus of its public health activities. In 1932 the health department constructed 300 sanitary privies and established its first prenatal clinics and well child conferences. By 1954 it was operating a medical care program, school health, mental health, handicapped children's, and chronic disease programs. The staff had grown from seven to 88 full-time workers. In 1932 a part-time psychiatrist for service in the schools was employed; in 1954 there were mental hygiene and alcohol rehabilitation clinics and psychiatric youth services.

William J. Peeples, M.D., is present county health officer; Lawrence M. Fisher is chairman of an advisory health committee.

Books and Reports

All reviews are prepared on invitation. Unsolicited reviews cannot be accepted.

Man's Mastery of Malaria—By Paul F. Russell. New York: Oxford University Press (114 Fifth Ave.), 1955. 308 pp. Price, $6.00.

This is the publication on which the 1953 University of London Heath Clark Lectures were based. When Dr. Russell was invited to give this series, he first prepared the manuscript of what he hoped would be a book, after which he condensed each of its five sections into lecture presentations. This departure from the usual custom of expanding lectures into a book seems to have worked well for the author. He has produced a unified, coherent volume of what he insists is not a history of malaria—though it is undoubtedly historical in its treatment of individual items. Dr. Russell prefers to think of it as something more of a selective retrospect with reference to certain personalities, concepts, developments, and events which have highlighted the evolution of knowledge about malaria. These particularities are examined carefully under Dr. Russell's high-power lens, and his description of what he has found in his literary researches will be enlightening to many who have felt that they possessed competent knowledge in this field.

The special objects of consideration are grouped into sections. The first deals with the cause and transmission of malaria, the second with malaria therapy, the third with various approaches to the prevention of the disease, and the fourth is concerned with certain international aspects of paludism and its control. The selected facets of these subjects are treated with historical thoroughness and detail. Wherever possible, the author has gone to original sources for his information, and this has resulted in the disclosure of many interesting and significant circumstances not previously published.

The fifth section is perhaps more introspective than retrospective for it is concerned with malaria and society, specifically the effects of malaria prophylaxis—now assuming world-wide dimensions in impact and extent—and population pressures, especially in the Far East. In it the author thoughtfully considers the dire portents and accusations of "neo-Malthusians" regarding large-scale disease control and prevention, differential rates of natality and mortality, and world food supplies. The author admits the problem but denies that it is a dilemma. In forceful language he states his assessment of the situation, defends his conviction that good public health practice and preventive medicine are not incompatible with restrained population growth, and expresses his ideas of what should be done to effectuate the latter. It makes good reading.

Paul Farr Russell is uniquely fitted to write this book. He is a well known malariologist; indeed he has probably observed and studied malaria from more diverse vantage points than anyone else now living. During the mid-twenties he was actively associated with the Leesburg (Georgia) Station for Malaria Field Studies, a pioneering enterprise established by the Rockefeller Foundation under the leadership of Dr. Samuel Taylor Darling. Most of Dr. Russell's professional career has been spent as a member of the field staff of the foundation in malaria research in various parts of the world, principally the Orient. During World War II, he

held a colonel's commission in the Medical Department of the Army, and served with distinction both in Washington, in the Office of the Surgeon General, and overseas in North Africa, Italy, and elsewhere. During the last two years he has been attached to the Division of Medicine and Public Health in the World Health Organization in Geneva and has visited many of its field operations in a consultant capacity. Thus he has achieved a truly world-wide perspective of malaria.

His book contains 20 illustrations, some of them reproductions of rare museum pieces. It has an excellent set of references, an index of persons, and a general index. It constitutes an outstanding contribution to the literature of malaria, but will be of intrinsic interest to medical historians, certain social scientists, and many lay readers as well.

JUSTIN M. ANDREWS

Your Annual Meeting—By Bernard Carp. New York: National Publicity Council for Health and Welfare Services (257 Fourth Ave.), 1955. 168 pp. Price $3.50; $2.50 to members of the National Publicity Council.

The principles and suggestions in this volume of fewer than 200 pages are designed to help in making the social organization's annual meeting a positive asset instead of an unproductive chore. Purpose, plan, and program are fully described with numerous illustrations of programs suited to objectives. Three types of tools are fully described. They are oral presentations in the form of speakers, panel, symposium, forum, quiz, etc.; discussion groups; and dramatization and visual tools.

There are chapters on how one works through committees, how a meeting is promoted, and finally the need and method for evaluating the annual meeting's significance.

Appendixes include a check list of things to remember, a work schedule about which the author says, "Every moment of the annual meeting must be anticipated and provided for in a detailed time table," and a bibliography.

The volume, with illustrations that raise a chuckle, is directed to agencies and organizations in local community settings, but it has relevance also to regional and national groups. If thoroughly understood and imaginatively applied, an annual meeting "where everyone knows where he is going and what he is doing without the usual confusion of great meetings" should be the result. This was the heartfelt tribute of an elevator operator who was curious about the behind-the-scenes effective activity that must have gone into what he saw at a recent annual meeting of a national organization.

MARTHA LUGINBUHL

First International Symposium on the Control of Insect Vectors of Disease—Sponsored by the European Regional Office of the World Health Organization and the Superior Institute of Health, with the collaboration of the Division of Sanitation of the World Health Organization. Supplement to the Reports of the Superior Institute of Health, Rome, Italy. Springfield, Ill.: Thomas (301 East Lawrence Ave.); Oxford, England: Blackwell Scientific Publications, Ltd. (49 Broad Street); Toronto, Canada: Ryerson Press (299 Queen Street West); Rome, Italy: Fondazione Emanuele Paterno (Viale Regina Elena, 299), 1954. 396 pp. Price (in Italy), 5000 lire.

These are the published presentations made at the above mentioned symposium held in Rome, October 26–30, 1953. They consist of 21 papers by 27 recognized authorities in the general field of insect control. They represent Canada, Corsica, Italy, United States, Spain, Morocco, Greece, Brazil, Israel, and Egypt.

The principal subjects discussed include: (1) the technology of insect disease vector and pest control, (2) field and laboratory observations concerning the development and mechanism of insect resistance to insecticides, and (3) health hazards and toxicology of modern insecticides.

Most of the papers review previous accomplishments of significance in the various areas of effort and add details of the authors' recent original researches. It is these reports of previously unpublished work that make this compilation of special value. The volume should be of interest and use to medical entomologists, sanitarians, and sanitary engineers concerned with the operational aspects of insect control; to public health administrators responsible for the prevention of arthropod-borne diseases; and to the scientists involved in the laboratory study of insecticides.

JUSTIN M. ANDREWS

Perinatal Mortality in New York City: A Study of 955 Deaths—Analyzed and Reported by Schuyler G. Kohl for the Subcommittee on Neonatal Mortality, Committee on Public Health Relations, the New York Academy of Medicine. Cambridge, Mass.: Published for the Commonwealth Fund by Harvard University Press, 1955. 112 pp. Price $2.50.

This study of stillbirths and neonatal deaths in New York City, under the aegis of the New York Academy of Medicine, is in the direct line of tradition of the academy's publication on maternal mortality in 1933 which did so much to destroy the professional and public complacency toward maternal deaths existing at that time. The present report should be of the utmost interest to health workers, in both clinical and public health practice, who wish to bring about a further reduction in perinatal deaths and provide the best care for other infants in the light of present-day knowledge. The detailed description of the method, forms, and questionnaires used, along with the critical comments about the study itself and suggestions emanating from the experience gained, should be of value to individuals planning similar studies.

A detailed analysis was made in each case of the clinical and pathological records, supplemented in many instances by interviews with physicians, nurses, and other persons. In those instances in which the results of the analysis were not clear-cut, the cases were referred for review by panels, each of which consisted of an obstetrician, a pediatrician, and a pathologist. All cases were classified according to preventability, taking into consideration such factors as adequacy of prenatal care, medical judgment, medical technics, fault of family, qualifications of medical attendant, and pediatric care.

The study concluded that 35 per cent of all the deaths were preventable. Errors in medical judgment were considered to be present in 31 per cent, unsatisfactory pediatric care in 27 per cent, and errors in medical technic 24 per cent, although these were not necessarily considered as directly related to preventability of death in a given case. Preceding the actual statistical analysis is a series of dramatic cases illustrating the various responsibility factors, which makes the subsequent statistical material more alive and meaningful.

EDWARD R. SCHLESINGER

Prescription for the Public Service—By E. S. Wengert, G. Lyle Belsley, and Charles H. Bland. Chicago, Ill.: Civil Service Assembly (1313 East 60th St.), 1954. 20 pp. Price, $2.00.

This 541st Personnel Report, prepared under the direction of the Civil Service Assembly of the United States and Canada, represents the efforts of three recognized public administrators

to analyze and prescribe for the complex problems found in the public service of the United States and Canada.

Professor Wengert (political science, University of Oregon) points out that a main illness of the public service may be the public itself. The continued attacks on and criticisms of government are not counter-balanced by general defense of government by public servants. Questions are raised as to the necessity for and desirability of political neutrality on the part of the public servant, the role of equality of treatment in producing mediocrity. The attacks on the public service prevent the adequate use of professional skills.

Mr. Belsley (associate director, Public Administration Clearing House) questions the relationships between personnel agencies and the rest of government, pointing out their isolation from the "deep stream of general management" and their preoccupation with procedures, their orientation to things rather than to people, attitudes probably motivated by the reform nature of civil service, an explanation not an excuse. Progress in developing constructive and positive personnel programs has been painfully slow.

Methods for attaining successful progressively positive personnel management include the delegation and decentralization of personnel activities to operating departments, the development of able career executives, the provision of executive salaries comparable to those in private business, the recruitment of persons with potential for growth, systematic promotion plans, and mobility for the purpose of better government by improvement and better utilization of skill. Pointing out the use of "rank in person" versus "rank in position" in several agencies, it is suggested that some such plan of permanent personal rank be considered at all levels of government. Planned executive training is needed.

Mr. Belsley, like his two colleagues, stresses the debilitating effect of attacks on government employees and the fears this spreads to otherwise competent employees. He fears government service may be forced to mediocre levels. Mr. Bland (president, Civil Service Commission of Canada) restricts his prescription to personnel management practices stressing the need for a positive attitude toward giving service to governmental agencies.

This personnel report combines the forward thinking of three well known champions of the principle of merit and positive personnel management in personnel administration. Excellent though the presentations are, their combined thinking in a joint paper would be welcomed. CHARLES F. FRASHER

Survey of Clinical Pediatrics—By Lawrence B. Slobody (2nd ed.). New York: McGraw-Hill Book Company (330 West 42nd St.), 1955. 502 pp. Price, $9.50.

The preface to the second edition begins: "This survey of clinical pediatrics is not intended to replace the excellent large textbooks . . . . It is rather designed to help the student focus on the highlights . . . ." It comprises 500 pages, or less than one-third the size of the larger texts; this compactness is evidence that the author who is professor of pediatrics at New York Medical College has achieved his purpose.

About one-fifth of the book comprises an outline of growth and development and of other information essential to intelligent health supervision. The remainder is concerned with diseases and is presented according to the various bodily systems, such as respiratory, gastrointestinal, and urinary diseases.

One's view of this text is conditioned by one's opinion of outlines and condensed texts of all kinds. Your reviewer believes that such condensations have value for review purposes, but that they

are worth very little as sources of initial learning.

For example, the statement is made: "Encuresis is urinary incontinence, usually nocturnal, past three years of age . . . many normal children may not achieve control until three and a half to four years of age." There is no discussion of the evidence that the range of normal is greater than this and that boys are ordinarily later than girls in developing sphincter control.

On the other hand, the chapter on "Treatment" has an excellent and lucid summary of drug therapy.

The book is valuable as an outline for review, but discussion is too brief to give a well rounded presentation of any problem. PAUL HARPER

Everything and the Kitchen Sink—New York: Farrar, Straus and Cudahy (101 Fifth Ave.), 1955. 160 pp. Price, $4.00.

"This is the story of progress and the makers of progress, of the men who have made possible American civilization as it is today and who built the basis of an even better future. . . . Little acclaim has been given the dynamic men who have made things that benefit the people—who utilized the freedom of expression and opportunity molded by the statesmen . . . who turned the brilliant dreams of the inventors into practical, available realities for everyone. This is a story of the ingenuity, initiative and foresight these men of progress possessed and of the almost unbelievable results they achieved."

This is an imaginative and dramatic pictorial review of the changes that have taken place in the last hundred years. It is prepared to recognize the centenary of Crane Company. It is noteworthy how public health, medical care, public cleanliness, public convenience, and recreation are featured. Anyone in a low mood can readily revive his spirit by reminding himself through these pictures of what has happened in this century and much of it within the lifetime of the living generation.

REGINALD M. ATWATER

Water Supply Engineering—By Harold E. Babbitt and James J. Doland (5th ed.). New York: McGraw-Hill, 1955. 608 pp. Price, $8.50.

Professors Babbitt and Doland have indeed accomplished a complete revision in this, the fifth edition of Water Supply Engineering. As stated in Professor Babbitt's preface, "This fifth edition differs from the fourth probably more than any earlier edition differs from its immediate predecessor." Anyone who has utilized this text as a student or teacher could readily testify to the changes that have been made. As proclaimed in the preface to the first edition which was published in 1929: "This book is intended primarily as a textbook for use in civil engineering courses as presented in many engineering curricula."

As a book of engineering practice, it meets a need for a classroom text and practitioner's reference in this, one of the more advanced fields of sanitary engineering. In order to keep abreast of the rapidly changing aspects of waterworks engineering practice, many of the problems, so conspicuously an inherent part of the previous editions, have been brought up to date. Other changes include the broader coverage of meteorology and hydrology, though it is regrettable that newer information available from such water loss studies as those conducted at Lake Hefner in Oklahoma is not utilized. The chapter in the fourth edition devoted to steam reciprocating machinery has been left out of the fifth edition and reference is made to it in a new chapter entitled Pumping Engines. In addition the section on Living Organisms in Water has been made into a separate chapter.

Since this was such an extensive revision of a standard text, this reviewer would have welcomed a special section on the chemistry of water which it is believed would aid the student and many practitioners in understanding the rapid advances which prompted the publication of this new edition. The extensive reference material which has been brought up to date has been maintained in the footnotes. The popularity of this book in the past will no doubt be maintained in the future and the few minor errata do not detract from the value of the over-all revision.

MAURICE A. SHAPIRO

Physical Education for High School Students—By the American Association for Health, Physical Education and Recreation. Washington, D. C.: AAHPER (1201-16th St., N.W.), 1955. 404 pp. Price, $3.00 cloth, $2.50 paper.

A book on physical education for the student is a unique idea, but one that may well be a milestone in the development of the field. At a level carefully adjusted to the reading ability and appreciation of secondary school boys and girls this volume interprets the purposes, activities, and over-all program for the ultimate consumer.

In each chapter the content goes beyond the activities themselves to include sportsmanship and safety in play. Separate chapters point up the how and why of fitness and conditioning, and provide useful information about careers in physical education and recreation. A careful and comprehensive illustration program helps to clarify descriptions of a wide variety of activities.

The volume constitutes a persuasive invitation to young people to develop understanding about physical education along with their participation. From its attractive cover all through its some 400 pages it has "youth appeal." It should assist in favorably conditioning the attitudes of today's students toward physical education. Perhaps more important it should give tomorrow's parents and school patrons better insight into the values of a broad program of physical education for all students.

FRED V. HEIN

Veterans Administration Technical Bulletins—Series 10, Vol. VII—Washington, D. C.: Department of Medicine and Surgery, Veterans Administration Technical Bulletin, 1954.

Another of the technical bulletins prepared by the Veterans Administration deserves mention because of excellent material included bearing on public health. This volume has chapters digesting current information on leprosy by James A. Doull, M.D., and on leptospirosis by Gerald Klatskin, M.D. In both cases the authors are well chosen and the summaries are concise, well documented, and splendid sources for review of current information.

Like the other technical bulletins there are reviews of clinical subjects, including uremia, psychotherapy, treatment of arterial hypertension, bacteremia, and medical management of patients with incurable cancer.

The Veterans Administration is to be congratulated on the high standards that prevail in these reviews.

REGINALD M. ATWATER

Airborne Contagion and Air Hygiene—By William Firth Wells. Cambridge, Mass.: For the Commonwealth Fund by the Harvard University Press, 1955. 423 pp. Price, $6.00.

Practical control methods for airborne infectious agents still remain desirable goals for the health worker and the experimental investigator. The relative importance of droplets, droplet nuclei, and secondary dust aerosols in the spread of such infections has never

been completely or accurately delineated. Many approaches, particularly in the field of upper respiratory disease, have been suggested, such as: spacing, improved ventilation, entrapment, and disinfection by chemical agents and ultraviolet radiation. None has proved satisfactory, especially in dealing with large populations and unusual exposure conditions.

The author has tilled this difficult field for over twenty years and this volume is essentially a repetition and summation of his many and varied investigations. To bring together the results of these labors in an orderly fashion, the book is divided into two sections. In the first part, the physics, physical chemistry, biology, biophysics and biochemistry of droplet nuclei are presented. In the latter half, attention is directed to his concept of the broad principles of sanitary ventilation and air hygiene. Much of the presentation deals with the specialized instrumentation developed for these ofttimes pioneer efforts. Many of the technics evolved are unique and ingenious and the author goes into great detail about the many variables to be considered.

Since this volume brings together the end results of a continuous effort for a long period of time in one area of preventive medicine, it will become a source book for investigators concerned primarily with the control of upper respiratory diseases and air-borne infections. Unfortunately, much of the material is very technical, and anyone without some competency in the field of aerobiology and more than a little knowledge of physics and aerodynamics will be quickly lost. It is not likely that the average health officer, sanitary engineer, or sanitarian with no special training will be able to follow the author's arguments for his theories in regard to the air transmission of disease and the value of ultraviolet radiation as an air disinfectant. This reviewer cannot believe that laymen without a professional understanding will be able to find a connected story of air hygiene and its place in the control of infections.

JOHN J. PHAIR

The Effect of Sugar Supplements on Dental Caries in Children—By J. D. King, May Mellanby, et al. Medical Research Council Special Report Series No. 228, London: Her Majesty's Stationary Office, 1955. 55 pp. Price, four shillings.

This study of sugar supplements on dental caries in children is interesting even though it would seem from the beginning that the expected results would show little difference, since the children eating the basal or control diets received relatively high amounts of sugar. For instance, it is stated that in each of the three centers—London, Liverpool, and Sheffield—the children received a balanced and adequate diet. As far as sugar was concerned, the report states that, even though it was comparatively easy to weigh and measure the amount of sugar used in the homes in cooking and for sweetening of dishes for the table, it was not possible to determine accurately the amounts eaten in the form of jam, syrup, honey and sweets (candies). It was estimated that the group on the control diet received from 12½ to 23 ounces of sugar per week.

For the period of the investigation, approximately 23 ounces of white sugar were added to the diet of the test group, while no additional sugar was added to the control or basal diet. The ages of the children ranged from two to 16 years and the London group consisted of 391 children observed for one year and 82 for two years, with the group nearly equally divided. One group received the basal diet, the second received an additional amount of refined sugar, and the third unrefined brown sugar.

Since the control group received a considerable amount of sugar, the conclusion reached would seem to have been expected, " . . . that relatively great differences in the total sugar content of the diet of children in institutions had no significant effect on the initiation or spread of dental caries in periods of 1 to 2 years."

The report is interesting but adds little to the existing knowledge in the field of sugar consumption and dental caries. CARL L. SEBELIUS

Morbidity in the Municipal Hospitals of the City of New York—By Marta Fraenkel and Carl L. Erhardt. New York: Russell Sage Foundation (505 Park Avenue), 1955. 229 pp. Price, $4.50.

This 229-page book is divided into 14 chapters with four appendixes and an index. It was prepared in the health and hospital departments of New York City. The 56 tables include a mass of detailed data on the 141,698 patients treated in the 31 New York municipal hospitals for a total of 3,064,986 patient-days, and 121,952 patients discharged during the six-month period May–October, 1952. In addition, data are included for 353,103 home-care patient-days and of 13,883 births with 72,971 days of care of the newborn.

These various data are classified into detailed diagnoses for the treated patients, with data on age and sex distribution, average stay, distribution according to length of stay, and according to other useful classifications. Explanations and analyses of the data are accurate and well done but the detailed tabular material alone constitutes a valuable reference work for health workers.

The diagnosis categories are shown in terms of the complete International Statistical Classification, but a Summary List of 203 diagnoses suitable for hospital morbidity reporting is also included, with hospital cases distributed by age and sex for each diagnosis category. SELWYN D. COLLINS

The Nation and the States, Rivals or Partners?—By William Anderson. Minneapolis, Minn.: University of Minnesota Press, 1955. 263 pp. Price, $3.75.

The powers and responsibilities of the national, state, and local governments and their relationships have been the subject of discussion and debate since the founding of this nation. Congress in 1953 created the Commission on Intergovernmental Relations to study the question. This book grew out of a "working paper" prepared by the author, a member of the commission, for the consideration of its Committee on the Principles and Historical Development of American Federal Government. It is not the report of the commission, having been written and published before the report was made.

The book provides a brief but factual and concise review of the development of our national governmental system and powers, particularly as they relate to the states, and of state-local governmental relationships. The text is interspersed with opinions of the author but these are identified and recognizable. It soon becomes obvious to the reader that the author is an advocate of strong national government and cogently supports his beliefs while presenting the arguments of the "States-Righters." He points out that in large part the disagreement is traceable to financing and policy related thereto. The final chapter is devoted to the author's suggestions for a program of constructive action in which he recommends no change in the present relationship other than strengthening and improvement. The author appends a list of suggestions for further reading.

The book is easily read, is interesting, and presents complex material in a

fashion which is easily understood. The subject is of sufficient interest to workers in government at all levels to make this volume important reading.

W. L. TREUTING

Anxiety and Stress: An Interdisciplinary Study of a Life Situation—By Harold Basowitz, Harold Persky, Sheldon J. Korchin, and Roy R. Grinker. New York: McGraw-Hill, Blakiston Division (330 West 42nd St.), 1955. 320 pp. Price, $8.00.

The authors present the results of a comprehensive study of an anxiety and stress-provoking life situation in the course of training of airborne troops. The material consists of randomly selected paratroopers in training and relevant control subjects. The methods include psychiatric interviews, psychological and biochemical tests. The purpose is to determine the psychobiological changes that occur in the process of training against a background of the type of personalities involved. Consideration is also given to the possibility of establishing criteria of predicting success or failure. The results demonstrate a pattern consisting of certain specific influences upon some of the psychological and biochemical functions, which is in keeping with observations made in anxiety states in situations other than the one studied. There are also, however, indications of lack of similarity with other changes that have been observed, particularly in patients suffering from anxiety states.

The design and methodology are sound and the material is well presented. The report is technical in parts and anticipates in the reader some familiarity with the subject discussed. This, however, is well balanced by a series of individual case reports, which make it possible to see the more intimate personality characteristics of the subjects studied and the implications of the conclusions reached. The book is extremely valuable not only to scientific workers, but also to those who are interested in the understanding of human behavior and performance under stress. Its particular value lies in setting up an excellent pattern of multidisciplinary research in psychosomatic studies.

WILLIAM MALAMUD

Principles of Medical Statistics—By A. Bradford Hill (6th ed.). New York: Oxford University Press (114 Fifth Avenue), 1955. 314 pp. Price, $4.00.

This well known book remains the best introduction to the statistical method for workers in medicine and public health. The present edition contains a new chapter on clinical trials, a field in which the author has won world-wide renown. The various issues that must be carefully thought through if a trial is to be wisely planned are presented with the author's usual lucidity and charm of style. As a "refresher" for anyone who is about to undertake a clinical trial, this chapter could hardly be bettered; one wishes there were more of it. Other changes from the fifth edition are minor.

WILLIAM G. COCHRAN

Books Received

Space and the interests of readers will permit review of some, but not all, of the books listed. Listing in this column acknowledges the receipt of books and our appreciation to the senders.

ADOLESCENT DEVELOPMENT. Elizabeth B. Hurlock (new 2nd ed.). New York: McGraw-Hill, 1955. 590 pp. Price, $6.00.

ADVANCES IN CANCER RESEARCH. VOL. III. Jesse P. Greenstein and Alexander Haddow. New York: Academic Press, 1955. 369 pp. Price, $8.50.

AMERICAN FOUNDATIONS AND THEIR FIELDS. Wilmer Shields Rich (7th ed.). New York: American Foundations Information Service, 1955. 744 pp. Price, $35.00.

CANCER CELLS. E. V. Cowdry. Philadelphia, Pa.: Saunders, 1955. 677 pp. Price, $16.00.

CANCER NURSING. A MANUAL FOR PUBLIC HEALTH NURSES (rev. ed.). A Joint Project of the National Cancer Institute, Public Health Service, Department of Health, Education, and Welfare and the New York State Department of Health. Albany, N. Y.: State Department of Health, 1955. 88 pp.

CARDIOVASCULAR DISEASE. DATA ON MORTALITY PREVALENCE CONTROL ACTIVITIES. Washington, D. C.: Gov. Ptg. Office, 1955. 68 pp.

CHEMOTHERAPY OF TUBERCULOSIS. Transactions of the 14th Conference, February 7–10, 1955, Atlanta, Ga., by the Veterans Administration, Army, Navy, with the Cooperation of the National Tuberculosis Association. Washington, D. C.: Veterans Administration, Department of Medicine and Surgery, Central Office, 1955. 556 pp.

CHILD BEHAVIOR. Frances L. Ilg and Louise Bates Ames. New York: Harper, 1955. 364 pp. Price, $3.95.

COMMUNITY ADULT EDUCATION. Robert H. Snow. New York: Putnam's, 1955. 170 pp. Price, $3.50.

DISEASES OF OCCUPATIONS. Donald Hunter. Boston, Mass.: Little, Brown, 1955. 1046 pp. Price, $20.00.

GUIDES TO SERVICES FOR HANDICAPPED CHILDREN: Committee on Child Health of the American Public Health Association. New York: American Public Health Association, 1955.

CEREBRAL PALSY. 108 pp. $1.50
CLEFT LIP AND CLEFT PALATE. 88 pp. $1.50
DENTO-FACIAL HANDICAPS. 80 pp. $1.50
HANDICAPPED CHILDREN. 150 pp. $1.50
Sets, Consisting of the Four Guides.....$5.10

HISTAMINE. ITS ROLE IN ANAPHYLAXIS AND ALLERGY. M. Rocha E Silva. Springfield, Ill.: Thomas, 1955. 248 pp. Price, $7.50.

HOSPITAL CARE OF MATERNITY PATIENTS AND THEIR NEWBORN INFANTS. Austin, Tex.: State Department of Health, 1955. 80 pp.

HOW TO FREE YOURSELF FROM NERVOUS TENSION. Samuel W. Gutwirth. Chicago, Ill.: Regnery, 1955. 200 pp. Price, $3.95.

INTERNATIONAL SURVEY OF PROGRAMMES OF SOCIAL DEVELOPMENT. Prepared by the Bureau of Social Affairs, United Nations. New York: Columbia University Press, 1955. 219 pp. Price, $2.00.

INTRODUCTION TO VIROLOGY. Gilbert Dalldorf. Springfield, Ill.: Thomas, 1955. 102 pp. Price, $3.50.

NEW CLASSIFICATION OF TUBERCULOSIS WITH NEW DIAGNOSTIC STANDARDS. Milosh Skekulich. London: Messrs. William Heinemann, 1955. 63 pp. Price, 3/6d Net.

NORMAL AND ELEMENTARY PHYSICAL DIAGNOSIS. Whitelaw R. Morrison and Laurence B. Chenoweth. Philadelphia, Pa.: Lea and Febiger, 1955. 412 pp. Price, $5.50.

OTHER MAN, THE. Donald J. West. New York: William Morrow, 1955. 224 pp. Price, $4.00.

PERSONALITY OF THE YOUNG CHILD. Margaret A. Ribble. New York: Columbia University Press, 1955. 126 pp. Price, $2.75.

POLIO AND SALK VACCINE. Roland H. Berg. New York: Public Affairs Pamphlet No. 150A, 1955. 28 pp. Price, $.25.

PREMATURE INFANTS. Ethel C. Dunham (2nd ed.). New York: Hoeber, 1955. 459 pp. Price, $8.00.

PREVENTION OF HEART DISEASE AND CANCER (BIOCLIMATOLOGY AND ETIOLOGY). J. E. Bittner. Yakima, Wash.: Bittner Research Foundation, 1955. 57 pp.

A PRIMER OF SOCIAL STATISTICS. Richard T. LaPiere, consulting editor. New York: McGraw-Hill, 1955. 251 pp. Price, $4.75.

PRINCIPLES OF MASS AND FLOW PRODUCTION. Frank G. Woollard. New York: Philosophical Library, 1955. 195 pp. Price, $7.50.

PROCEEDINGS OF THE GOVERNOR'S CONFERENCE AND EXHIBIT ON ATMOSPHERIC POLLUTION. New Jersey State Department of Health, February 19–20, 1952. Trenton,

N. J.: State Department of Health, Bureau of Adult and Industrial Health, 1955.

PROCEEDINGS OF THE THIRD MEDICAL CONFERENCE OF MUSCULAR DYSTROPHY ASSOCIATIONS OF AMERICA, INC. New York: October 8–9, 1954. New York: Muscular Dystropy Association, 1955. 324 pp.

PSYCHIATRIC RESEARCH REPORTS I. Washington, D. C.: American Psychiatric Association, 1955. 152 pp. Price, $2.00.

PUBLICATIONS AND ADDRESSES 1900–1955. INCLUDING EDITORIALS AND RADIO SCRIPT. Richard Arthur Bolt. Berkeley, Calif.: University of California School of Public Health, 1955. 75 pp.

THE QUANTITATIVE ANALYSIS OF DRUGS. D. C. Garratt (2nd ed.). New York: Philosophical Library, 1955. 670 pp. Price, $17.50.

A SHORT HISTORY OF MEDICINE. Erwin H. Ackerknecht. New York: Ronald Press, 1955. 258 pp. Price, $4.50.

THE STATES AND THEIR OLDER CITIZENS. Chicago, Ill.: Council of State Governments, 1955. 194 pp. Price, $3.00.

TEAMWORK IN HANDLING GUIDANCE AND HEALTH PROBLEMS. Edited by Warren H. Southworth and Desmond D. O'Connell. Sponsored by the Summer Session, Department of Education, University of Wisconsin. Madison, Wis.: Kramer Business Service, 1955. 69 pp. Price, $1.00.

TEXTBOOK OF MEDICINE. Edited by Russell L. Cecil and Robert F. Loeb (9th ed.). Philadelphia, Pa.: Saunders, 1955. 1786 pp. Price, $15.00.

TUBERCULOSIS AND THE INDIVIDUAL. J. S. Campbell. London: Tavistock House North, W.C. 1, 1955. 92 pp. Price, 5s. 0d.

UNDERSTANDING PEOPLE IN DISTRESS. Barney Katz and Louis P. Thorpe. New York: Ronald Press, 1955. 357 pp. Price, $4.00.

WHY PATIENTS SEE DOCTORS. Seymour Standish, Jr., et al. Seattle, Wash.: University of Washington Press, 1955. 94 pp. Price, $2.50.

WHYS AND WHEREFORES IN TUBERCULOSIS. George Day. London: Tavistock House North, W.C. 1, 1955. 44 pp. Price, 3s. 6d.

YOU AND YOUR CHILD. Winifred De Kok. New York: Philosophical Library, 1955. 147 pp. Price, $3.75.

"Use of Sampling" in Spanish

The Inter-American Center of Biostatistics has translated into Spanish "On the Use of Sampling in the Field of Public Health." This article was prepared by the Committee on Sampling Techniques of the Statistics Section of the American Public Health Association, whose chairman was Theodore D. Woolsey, biostatistician of the Public Health Service's Division of Public Health Methods, and was published in the June, 1954 issue of the American Journal of Public Health. Reprints in English are available from the Association. Further information about availability of the Spanish translation from Dr. Octavio Cabello, Centro Interamericano de Bioestadistica, Av Sta. Maria 0760, Santiago, Chile.

A Selected Public Health Bibliography with Annotations

This Makes It Official—Usefully summarized is the technical report on the Salk vaccine that was made to the Secretary of HEW. Copies of the report have gone to all state and city health officers but the summary also has its uses for it pin points the thorny technical problems in making and testing the vaccine.

ANON. Technical Report on the Poliomyelitis Vaccine. Pub. Health Rep. 70, 8:738 (Aug.), 1955.

New Idea—Isoniazid given daily in their drinking water seems to protect guinea pigs from infection with tubercle bacilli. Whether or not it may protect human subjects against tuberculosis is to be looked into by means of a large-scale demonstration.

ANON. Experiments with Isoniazid as a Preventive Measure Against Tuberculosis. Pub. Health Rep. 70, 8:759 (Aug.), 1955.

No. 1 Killer—"Accident prevention constitutes the broadest single area for life conservation among children of elementary school age." To that warning—which is based upon incontrovertible statistics—some health departments are giving heed. Those that are not might well ponder over this further assertion: "Among boys . . . ages 10–14 . . . accidents took a greater number of lives than all other causes combined."

ANON. Accident Toll at the School Ages. Statist. Bull. Metrop. Life Insur. Co. 36, 8:1 (Aug.), 1955.

Matters of Adjustment—Twenty-seven psychologists, biologists, and sociologists sat down to consider profitable methods for studying the aging processes. Briefs of eight papers representing five panels of the program offer a revealing summation of the three-day sessions.

ANON. Psychology of Living. Pub. Health Rep. 70, 7:837 (Sept.), 1955.

No Rh Antigens Here—Because poliomyelitis vaccine is grown on a medium with monkey kidney tissue the possibility of sensitizing the recipient to Rh antigens appears to have been raised. The sensitive tests reported upon show no trace of such antigens and no significant antibody response.

ABELSON, N. M., et al. Studies in Rh Sensitivity After Repeated Injections of Salk Vaccine. J.A.M.A. 159, 4:238 (Sept. 24), 1955.

They Want to Be Sure—The story of an effort on the part of the New York State Department of Health to find out how much its nutrition program was accomplishing presents a lot of good ideas that might profitably be put to work measuring other service programs—a job that almost any health agency could undertake to good effect in most, or all, of its activities.

BROWE, J. H. Evaluation of a Nutrition Program. J. Am. Dietet. A. 31, 9:895 (Sept.), 1955.

Compounded Confusion—After reviewing the 48 varieties of immunization practices in these several (United?) States the author asks—quite rightly—if there is any reason why there should not be more common agreement upon standards while leaving room for necessary individualization.

ELIOT, J. W. Variation in State Immunization. Pub. Health Rep. 70, 9:822 (Sept.), 1955.

Sub Rosa—Anyone faced with the ordeal of addressing a graduating class—graduating from almost any training area in our field—can get a lot of inspired ideas from this brilliant address. As it was given at a distance of three thousand miles it isn't likely that the hearers will wonder where they heard that before when a thought or two is taken into custody. Don't let this get around!

ELLIS, R. W. B. Initiation. Lancet 269, 6887:403 (Aug. 27), 1955.

For the Clean-Up—What will be needed next, these writers propose, is a "TB suspect registry" to list all skin-test reactors and people with suspicious x-ray findings. These people could then be followed up at intervals. This will be practical, of course, only in low-incidence areas, the writers are quick to point out.

GELPERIN, A., et al. Appraisal of Tuberculosis Case Finding. Pub. Health Rep. 70, 8:761 (Aug.), 1955.

Significant Statistic—It required half a century for the country to build up its 110,000 hospital beds for the tuberculous. Then came 1953 and with it a sharp decline in patients to occupy the beds. There was a 6.7 per cent decrease in eight short months from spring to fall of 1954. The breakdown of facilities and their utilization provides a lot more information about trends.

GLASER, S., et al. Change in Tuberculosis Beds Occupied. Pub. Health Rep. 70, 9:859 (Sept.), 1955.

Genetic Fits and Misfits—Four of the frequently advanced arguments that social and medical and health services are dysgenic, because the unfit survive to beget more misfits, are given a brief working over and are knocked into a cocked-hat.

GOLDSTEIN, M. S. Theory of the Survival of the Unfit. J. Nat. M. A. 47, 4:223 (July), 1955.

Faulty Feeding—Though growth rates of babies have improved over the last quarter century, reflecting better nutritional and disease preventive practices, we really could do a great deal better than we are doing. Making fuller use of present-day nutritional and psychologic knowledge would do the trick without additional research gains.

JACKSON, R. L. Feeding Healthy Infants. Am. J. Nursing 55,9:1076 (Sept.), 1955.

Men (and Women) at Work—Reporting upon the Tucson school health program the school physician says, ". . . Every school child who needed care received it insofar as we have been aware of the needs. . . ." As the advertisers put it, "no one else can make this claim"—or can anyone? How the job was done would seem to be required reading for all in the MCH and school health fields.

LAIDLAW, E. H. The Health Council and Its Revolving Health Fund—Tucson Arizona City and County Schools. Pediatrics 16, 3:411 (Sept.), 1955.

Imported Concept—"Health visitors who have done such excellent work in reducing physical disease, now have to grapple with the gigantic task of stemming the tide (of mental and emotional disorders). If they fail, God help our civilization for there is no other line of defense."

MACQUEEN, I. A. G. The Role of the Health Visitor in the Prevention of Mental and Emotional Disease. M. Officer 94, 7:83 (Aug. 12), 1955.

Prenatal Brain Injuries—Mental deficiency, which the authors assert is the most serious public health problem from the points of view of chronicity, cost, loss of productivity and family

tragedy, may be a part of that continuum of reproductive wastage which extends onward from early fetal deaths and stillbirths.

PASAMANICK, B., and LILIENFELD, A. M. Association of Maternal and Fetal Factors with Development of Mental Deficiency. J.A.M.A. 159, 3:155 (Sept.), 1955.

Putting It Mildly—"There is a temptation for sanatoria and official and voluntary health agencies to take credit for the decline (of tuberculosis mortality) which has occurred, but with little factual evidence upon which to base such claims." This dearth of factual evidence is examined in an illuminating review of the whole matter of the people vs. tuberculosis.

POPE, A. S., and GORDON, J. E. The Impact of Tuberculosis on Human Populations. Am. J. M. Sc. 230, 3:317 (Sept.), 1955.

"Age of Medicated Survival"—What is good and what is not yet right about the British medical care service are both set forth by a reporter who seems to possess a fine objectivity toward the controversial matter. If his is the special pleading we usually are regaled with then he is a master at concealment.

ROBERTS, F. Britain's Health Service. New England J. Med. 253, 8:318 (Aug. 25), 1955.

If additional information is desired regarding the articles listed in the Bibliography, please communicate directly with the publications in which they appeared; the addresses are furnished for your convenience.

Am. J. Nursing (American Journal of Nursing), 2 Park Ave., New York 16, N. Y.
Am. J. M. Sc. (American Journal of Medical Sciences), Lea & Febiger, 600 South Washington Sq., Philadelphia 6, Pa.
J. Am. Dietet. A. (Journal of the American Dietetic Association), 620 N. Michigan Ave., Chicago, Ill.
J.A.M.A. (Journal of the American Medical Association), 535 N. Dearborn St., Chicago, Ill.
J. Nat. M.A. (Journal of the National Medical Association), 30 Rockefeller Plaza, New York, N. Y.
Lancet (The Lancet), 7 Adam St., Adelphi, London, W.C. 2, England.
M. Officer (Medical Officer), Whitefriars House, 72–78 Fleet St., London, E.C. 4, England.
New England J. Med. (New England Journal of Medicine), Massachusetts Medical Society, 8 The Fenway, Boston 15, Mass.
Pediatrics (Journal of the American Academy of Pediatrics), 301–327 E. Lawrence Ave., Springfield, Ill.
Pub. Health Rep. (Public Health Reports), Gov. Ptg. Office, Washington, D. C.
Statist. Bull. Metrop. Life Insur. Co. (Statistical Bulletin Metropolitan Life Insurance Company), One Madison Avenue, New York 10, N. Y.

Association News

EIGHTY-THIRD ANNUAL MEETING
AMERICAN PUBLIC HEALTH ASSOCIATION
KANSAS CITY, MO., NOVEMBER 14–18, 1955

West Virigina Health Conference

The 31st Annual State Health Conference, sponsored by the West Virginia Public Health Association in cooperation with the West Virginia State Department of Health, was held in Charleston September 7–9. The first day was given over to a preconference health education workshop emphasizing current developments in health education in West Virginia with particular reference to voluntary agencies.

The program for the second two days featured state and national speakers on the subject of public health in West Virginia, with emphasis on local responsibility for providing local health services. A panel on the latter subject was moderated by F. J. Holter, Ph.D., from the School of Education in the University of West Virginia. Participants included health and education workers and public officials of various municipalities in the state. Among the speakers from outside the state were Eugene A. Gillis, M.D., regional medical director, Public Health Service; Ruth G. Taylor, R.N., chief, Nursing Section, Children's Bureau; and Samuel M. Wishik, M.D., professor of maternal and child health, University of Pittsburgh Graduate School of Public Health.

The following officers were elected:

President—Eugene M. Ashworth, chief of rehabilitation services, State Division of Vocational Rehabilitation

Vice-presidents—Oliver Matthews, sanitarian, Preston County Health Department; Madge L. Duncan, R.N., supervising nurse, Harrison County Board of Education

Treasurer—Katherine L. Brown, chief clerk, State Bureau of Tuberculosis Control

Representative to APHA—Guy R. Post, M.D., health officer, Wood-Parkersburg Health Department

Bryant Memorial Award

The Texas Public Health Association has announced an award in memory of Dr. and Mrs. William Bryant. Dr. Bryant served as health officer of Smith County, Tex., for more than 20 years. The person to receive the award will be selected at the end of each calendar year by a committee appointed by the executive board of the association. Names of candidates may be submitted to the committee by health agencies, official or nonofficial, or by individuals. The chairman of the committee is Dr. Austin E. Hill, director of health, Houston Public Schools.

The award will be an all-paid trip to the joint annual meetings of the American Public Health Association and the American School Health Association and the recipient will be presented with a scroll describing his achievements.

Pennsylvania Looks to the Future

At its annual meeting in August the Pennsylvania Public Health Association named a Steering Committee to carry

out, with subcommittees, a four-fold program for the coming year. There are subcommittees for summarizing the public health gains that have been made in the state since the survey of 1948, for studying where the state is going in public health, and for carrying out an extensive membership campaign. A fourth committee deals with the problems of recruitment and inservice training.

R. Winfield Smith, executive director, Pennsylvania Tuberculosis and Health Society, is chairman of the Steering Committee, which includes also Mary E. Bean, R.N., president, Pennsylvania Nurses' Association, Bernard M. Blum, M.D., director, Fife-Hamill Memorial Center, Philadelphia, and Norman R. Ingraham, Jr., M.D., deputy director, Philadelphia Health Department.

At this meeting also county health departments were strongly endorsed and Bucks and Butler Counties were commended "for being the first to accept the principle of county health departments."

Correction to Standard Methods

The October issue of the Journal carried a notice of errors occurring in the 10th Edition of "Standard Methods for the Examination of Water, Sewage, and Industrial Wastes." The last item referred to an error reported as appearing on page 399. This page reference should have read 339.

APHA membership application blank on page XXVII

Employment Service

The following pages present information for those seeking public health personnel and for those seeking positions in public health. Other information concerning vacancies and personnel available is on file in the Association Office. Anyone wishing to have the benefit of this additional information can obtain it by writing to the Vocational Counseling and Placement Service of the Association.

Advertising space in these pages is available at special rates for the use of employers or individuals. The charges are $5 for the first 50 words or fraction thereof and $1 for each additional 10 words or fraction thereof. There is no charge to members or Fellows of the Association who desire to utilize the **Positions Wanted** portion of these pages.

POSITIONS AVAILABLE

Physicians Wanted—Openings for public health physicians in Kentucky. Salaries up to $11,000 per annum. Contact Bruce Underwood, M.D., State Health Commissioner, 620 South Third Street, Louisville 2, Ky.

M.D. for Assistant Health Director and Administrator of Clinics—Pima County Health Department, Tucson, Ariz. General Public Health Program with emphasis on Well Baby, Sick Baby, and Prenatal Clinics. Man preferred. Salary begins $7,800. Applicant send picture, age, references, and reasons for changing position. Esther M. Closson, M.D., Director.

Wanted—Director of Public Health—Full-time, $11,000–$12,500 in five automatic annual increments. Life-time tenure by city charter. M.D., M.P.H., and Connecticut license required. Apply Dr. Albert E. Herrmann, President of City Board of Health, Waterbury, Conn.

Medical Director—to plan and carry out a state-wide program of services for crippled children. Qualifications: M.D. with special training in pediatrics or orthopedics plus experience in public health or the private practice of medicine. Must be eligible for Kentucky licensure. Salary $12,000. Write Merit System Supervisor, Kentucky Dept. of Health, 620 South Third, Louisville, Ky.

Public Health Physician—to be appointed Assistant Director of Health and be in charge of Division of Preventable Disease Control for the Tacoma-Pierce County Health Department. Population, 300,000. Salary range $795–$915. Experience and training in public health desired. Write to: C. R. Fargher, M.D., Director of Health, 2324 Pacific Avenue, Tacoma, Wash.

Health Educator—for long established well organized health department. Master's degree from approved school of public health, with specialization in health education required. Salary $4,200–$4,800. Good personnel policies. Agency car provided. Cattaraugus County Dept. of Health, P. O. Box 573, Olean, N. Y.

Public Health Educator—for general public health education program. Master's degree required. Civil Service appointment. Salary range $4,584–$5,227. E. R. Krumbiegel, M.D., Milwaukee Health Dept., City Hall, Milwaukee, Wis.

Health Education Consultant—to assist in planning and carrying out the educational program for the Pennsylvania Tuberculosis and Health Society. Prefer an M.P.H. degree or advanced degree from a recognized college or university with experience in a state or local tuberculosis association or similar satisfactory experience. Minimum salary $4,800 based on qualifications and experience. Annual increment to $5,700. National Tuberculosis Association Retirement Plan and Social Security. Eight cents per mile car allowance. Write Otto Kuscher, Director, Health Education, Pennsylvania Tuberculosis and Health Society, 311 South Juniper Street, Philadelphia 7, Pa.

Sanitarian for Peoria City Health Department—Assistant to the Director of Division of Sanitation. Should have M.P.H. degree and experience. $4,800 plus good retirement benefits starting salary. Dr. Fred Long, City Hall, Peoria, Ill.

Sanitary Engineers—to work in California state public health program of water supply, waste disposal and vector control. Opportunity for advancement. Two years' experience, including at least one in sanitary or public health engineering, and college degree will qualify. Civil or chemical engineering experience or training applicable. Salary starts $436. Periodic raises to $530. Write Recruitment Section, State Personnel Board, 801 Capitol Ave., Sacramento 14, Calif.

Sanitarian-Trainee Position—Twelve months supervised field training available in rural health district. Generalized program. University of Michigan and Michigan Depart-

ment of Health approved training center. $300 per month stipend. Car furnished (can also be used for private use). Now open to graduate or undergraduate. Donald M. Harris, M.D., Director, Branch-Hillsdale District Health Department, Main Office, Coldwater, Mich.

Sanitary Engineers and Sanitary Chemist—to work on state public health program. Previous Ohio residence not required. **Sanitary Engineer III**—primarily for public water supply development and water treatment. Supervision of design and operation. Graduation from accredited engineering college, five years' experience, professional engineer registration from Ohio or reciprocal state required. Salary range $500–$600. **Sanitary Engineer II**—primarily for river basin water pollution studies involving collection, interpretation and assembly of report data. May lead to additional phases of public health engineering. Graduation from accredited engineering college, four years' experience, ability to quality for registration. Salary range $440–$525. **Engineer-In-Training**—to assist in river basin water pollution studies. Graduation from accredited engineering college, including having certificate of professional engineer-in-training. Salary range $360–$440, $400–$480, $440–$525 based on experience. **Sanitary Chemist**—responsible for analytical work of mobile laboratory assigned to river basin water pollution studies. Graduate in chemistry. One year's experience in sanitary chemistry. Salary range $360–$440. Write to: Personnel Office, Ohio Department of Health, Columbus 15, Ohio.

Public Health Bacteriologist—Immediate opening. Salary range, $337–$417. Public Health Bacteriologist and Milk Bacteriologist Certificates issued by the State of California required. Selection will be made on the basis of personal interview or investigation. Apply Orange County Personnel Department, 644 No. Broadway, Santa Ana, Calif.

Sanitarian—Immediate opening. Salary range $337–$417. Registration or eligibility for registration by the State of California as a sanitarian required. Selection will be made on the basis of personal interview or investigation. Apply Orange County Personnel Dept., 644 North Broadway, Santa Ana, Calif.

Bacteriologist—New York State County Laboratory, modern, well equipped and staffed laboratory. Master's degree or bachelor's degree with equivalent experience. Civil service but temporary appointment can be arranged. Salary $4,200 going to $4,700 by five annual $100 increments. Joseph Lebowich, M.D., Saratoga County Laboratory, 215 Church Street, Saratoga Springs, N. Y.

Associate Industrial Hygienist—for City of Detroit. Salary $7,506–$8,349. Supervising industrial hygiene field and laboratory work. Requires reasonable postgraduate study in industrial hygiene or related fields and experience in supervision of industrial hygiene work. For detailed information write: Detroit Civil Service Commission, City-County Building, Detroit 26, Mich.

Public Health Physician—desiring to retire from strenuous activities, to operate active office doing nutrition exclusively. Limited hours. Salary and other emoluments. M. D. Ailes, M.D., 208 First Federal Bldg., 326 S. Main St., Akron, Ohio.

Health Director's Assistant—Salary range $5,616–$6,656 per year. Open to male and female resident citizens of the United States who possess the minimum qualifications. Complete details may be secured by writing to Personnel Director, Municipal Building, Hartford, Conn.

Executive Director Position—Midwest Visiting Nurse Association. Large Industrial city. November 1. Good personnel policies. Salary range $6,000–$7,500. Write **Box C–28,** Employment Service, APHA.

Public Health Staff Nurse—Generalized program, including school nursing; 22 staff nurses; supervision, continuous staff education, opportunity for student adviser experience; must be eligible for P.H.N. and R.N. Certification in California. Salary range: $341–$426 a month; 11 paid holidays; 10 working days vacation; sick leave; pension; car furnished. San Jose City Health Dept., San Jose, Calif.

Public Health Nursing Positions—Available in health department with the City of Flint a rapidly growing city of 180,000 population. Beginning, intermediate, and administrative positions are available. Five-day, 40-hour week with liberal retirement, vacation and sick leave policies. Beginning salary rates, depending on experience and qualifications, $3,498, $3,783. $4,147 with automatic increases. Apply Flint Civil Service Commission, City Hall, Flint, Mich.

Washington State—Attractive positions are available for **Public Health Nurses** in well established full-time local health departments in Washington State. Salary range: $301, $314, $328, $343, and $358 per month. Appointments may be made above the beginning rate for experienced nurses. Five-day week, plus vacation, sick leave, and mileage allowance. Persons interested should write at their earliest convenience to: Robert G. Beaumier, State Dept. of Health, 1412 Smith Tower, Seattle, Wash.

Public Health Nurses—for San Bernardino Valley area and Barstow. Eligibility for state public health nurse certificate, citizenship, and car required. Starting salary, $327 for valley area, for Barstow, $360; step increases to $397. Write San Bernardino County Civil Service, 236 Third St., San Bernardino, Calif.

Public Health Nurses—for generalized service having at least one year in approved public health nursing course, or graduation from approved school of nursing, preparing students for beginning PHN positions. Excellent opportunities for nurses wishing to work in the West. Positions available in all parts of the state. Salary adjustable to education and experience. Generous personnel policies. Apply: Director of Nursing, State Board of Health, Division of Public Health, Box 640, Boise, Idaho.

Qualified Public Health Nurse—Two-nurse voluntary agency, generalized program. Salary $3,500, four week vacation, sick leave, social security, 39-hour week. Car provided. Apply to Mrs. John Kolb, Chestnut St., Seymour, Conn.

Public Health Nurse—New position available. Generalized public health program, Napa County, 50 miles from San Francisco. Salary range: $341–$415; liberal benefits; starting salary dependent on training and experience. Automobile required; car allowance supplied. For job description and application, write Edward R. Pinckney, M.D., Box 749, Napa, Calif.

Career Positions in Public Health Nursing—Nation-wide open competitive examinations for wide variety merit system nursing positions. Pennsylvania Department of Health: Assistant Director, Bureau of Public Health Nursing, $6,294–$6,990; Public Health Nursing Consultants in Maternal and Child Health, Cancer, Orthopedic, Communicable Disease, Industrial, Tuberculosis, Mental Health, and Venereal Disease, $5,058–$5,652; Regional P.H. Nurse $5,058–$5,652; District P.H. Nurse, $4,260–$5,058; Public Health Nurse, $3,882–$4,260; Public Health Nurse Trainee, $3,666–$3,882. For information and applications, write State Civil Service Commission, Box 569, Harrisburg, Pa., before final filing date of November 18.

Public Health Nurse—for generalized nursing program in city of 300,000 population, not including school health services; salary range $361–$439 monthly; car furnished; 40-hour, five-day week, annual and sick leave, retirement benefits; California PHN certificate required. Write I. D. Litwack, M.D., Health Officer, Dept. of Public Health, 2655 Pine Avenue, Long Beach 6, Calif.

Chief of Public Health Nursing—Female, under 50. Graduate of a nursing school with one year of additional public health study. Six years of public health experience, four of which shall have been in a supervisory capacity. Driver's license. Salary range $4,784–$5,720 annually. G. P. Leveque, Personnel Administrator, Dept. of Personnel, Richmond, Va.

Public Health Nurse—Salary range $3,536–$3,952 per year. Open to female resident citizens of the United States who possess the minimum qualifications.

Medical Social Work Adviser—Salary range $3,796–$4,420 per year. Open to female resident citizens of the United States who possess the minimum qualifications.

Medical Technologist I—Salary range $3,224–$3,692 per year. Open to resident citizens of the United States who possess the minimum qualifications.

Medical Social Worker—Salary range $3,588–$4,212 per year. Open to female resident citizens of the United States who possess the minimum qualifications. Complete details may be secured by writing to Personnel Director, Municipal Building, Hartford, Conn.

International Vacancies

Public Health Officers—Several positions for public health administrators and malariologists are to be filled immediately for posts in Latin America. Candidates for public health officer posts must have graduate public health training and extensive experience in the field. The malariologists should have considerable experience in malaria programs, including the use of newer residual insecticides. A working knowledge of Spanish is essential. Salary: $7,300 per annum, plus tax reimbursement; travel installation and subsistence allowances, field equipment, education, and dependent grants.

Public Health Engineers for Latin America—Several positions are open in Brazil, Colombia, Mexico, Nicaragua, Peru, Venezuela, and the Caribbean area. Essential qualifications include graduate training and experience in public health and a working knowledge of Spanish (Portuguese for Brazil). Salary: $7,300 per annum, plus tax reimbursement; travel installation and subsistence allowances, field equipment, education, and dependent grants.

Public Health Nurses and Nurse Educators—Qualified public health nurses and nurse educators are needed immediately for assignment in field programs in Latin America. Candidates must have advanced education in public health nursing or nursing education and extensive experience, including supervision, administration, or teaching. Although knowledge of Spanish is desirable, it is not required for all positions. Salary range: $4,800–$6,000 per annum, plus tax

reimbursement; travel installation and subsistence allowances, field equipment, education, and dependent grants. Personnel Officer, World Health Organization, 1501 New Hampshire Ave., N.W., Washington 6, D.C.

Executive Director, Mental Health Association—for a county of over one million population adjacent to New York City. Established citizens' organization with diversified program activities including independent fund drive, affiliated with State Society and National Association for Mental Health. Graduation required from a university plus suitable experience in social agency work emphasizing community organization and administration. Salary attractive, retirement plan, travel allowance. Apply: Louis Winer, President, Mental Health Association of Nassau County, Inc., 137 Willis Avenue, Mineola, N. Y.

POSITIONS WANTED

A Health Educator—British subject, holding M.Sc., M.P.H., and Ph.D. degrees in health education and with several years' experience in teaching health education in medical college, teacher's training college, and elsewhere and organizing country-wide health education programs in a British colony, seeks position as a health education consultant or as health education professor with any international agency or foreign governments. Write **Box H.E.-70**, Employment Service, APHA.

Health Educator—M.S.P.H.Ed. Columbia University School of Public Health in 1952, army veteran. Desires position in field of public health education or administration. Write **Box H.E.-71**, Employment Service, APHA.

Public Health Physician—M.P.H. and Diplomate with eight years' generalized experience in district serving both urban and rural areas desires to relocate in north central metropolitan area where college or university is available. Would consider public or private agency where education and experience could be utilized. Write **Box P.H.-55**, Employment Service, APHA.

Commercial Advertisements

All communications on the following commercial advertisements should be sent to Burneice Larson, Medical Bureau, Palmolive Building, Chicago 11, Ill.

OPPORTUNITIES AVAILABLE

(a) Commissioner of health; staff of 20; town, 90,000, short distance from large city, medical center; $12,000. (b) School physician; school population 21,000; 12 nurses; East. (c) Public health physician to serve as assistant director, one of leading insurance companies. (d) Health educators; outside continental United States. (e) Sanitarian; large industrial company; Pacific Northwest. (f) Health inspector; knowledge of meat and dairy product inspection required; foreign assignment; two-year contract; renewable; $8,400. (g) Executive director; well established public health nursing association; staff of 40; active educational program; large city, medical center, Midwest; $6,000–$7,500. (h) Public health nursing consultants and educators; South America. (i) Public health nurse to serve as outpatient and emergency supervisor; 700-bed medical center increasing to 1,400; university city, South. (j) Public health nursing instructor; liberal arts college; East.

OPPORTUNITIES WANTED

(a) Health educator; M.P.H., Harvard, three years, assistant director and six years, director, state health department. (b) Public health bacteriologist; M.S. (bacteriology); seven years, bacteriologist, metropolitan health department. (c) Public health nurse; M.P.H., Yale; seven years' interesting experience in public health nursing administration. (d) Public health physician; M.P.H., Hopkins; Diplomate; eleven years, director, metropolitan health department. (e) Sanitary chemist and bacteriologist; B.S., chemistry; M.S. bacteriology; six years, chemist and bacteriologist, state health department.

News from the Field

WHO News

Half of UNICEF's Funds to Malaria

The executive board of UNICEF, meeting in September, allocated $2,400,000 to assist in the first 18 months of a five-year spraying campaign to eradicate malaria in Mexico. This sum, representing about one-third of the total allocations made, will provide transport, DDT, dieldrin, sprayers, and microscopes for the Mexican government's campaign.

With nearly a million dollars allocated for malaria eradication programs in six other areas of the world, nearly half of program expenditures are designated for malaria control. This follows a March meeting of the executive board at which malariologists urged speed because of the time limit governing the effectiveness of known insecticides to kill malaria-carrying mosquitoes. About one-fourth of program expenditures, $2,100,000, are allocated for maternal and child health projects; nutrition projects will receive nearly $600,000.

PASB Directing Council Meets

The Directing Council of the Pan American Sanitary Organization met in Washington, September 9–19, to review the work of its executive body, The Pan American Sanitary Bureau, WHO Regional Office for the Americas, and to act on its proposed budget and program for the coming year. The council is composed of delegates from the 21 American republics and representatives of France, the Netherlands, and the United Kingdom.

A budget of $2,200,000 for 1956 was voted for the health programs of the bureau. An additional more than a million has been allocated to the region by WHO; UNICEF and Technical Assistance funds will also be available.

The 130 projects to be carried on by the bureau in 1956 cover practically all phases of public health. High on the list is the eradication of communicable diseases, malaria most notably. A Coordinating Office for the Malaria Eradication Program has been set up in Mexico City to coordinate a continent-wide program. The practical eradication of yaws in Haiti is stimulating similar programs by other governments to which the bureau will give assistance.

Second in importance to eradication in the bureau's work, as reported by the director, Fred L. Soper, M.D., is integration, which he defined as the strengthening of national public health administrations and the coordination of all services contributing to the health of a population. Education, or the training of personnel, is the third of the three categories into which he divided the work of the bureau.

Leonard A. Scheele, M.D., Surgeon General of the Public Health Service, was the United States representative at the meeting of the council. The ninth meeting of the council will be held in Guatemala City in the fall of 1956.

Do People Shun Chest X-Rays? Why?

The combined technics of the sociologist, psychologist, economist, and public health physician are being applied to determine the factors involved in motivating persons to take or avoid taking chest x-rays in New York City. The Health Department is undertaking a high-concentration mass x-ray survey in a pilot area as a forerunner to a possible similar approach to the tuberculosis control program in other areas. In cooperation with the Bureau of Public Health Economics of the University of Michigan School of Public Health, an evaluation study of the fac-

tors involved in the success and failure resulting from this effort is being made.

The Michigan group includes Nathan Sinai, Dr.P.H., director; S. J. Axelrod, M.D., associate director; Charles A. Metzner, Ph.D.; and Gerald Gurin. The social science disciplines have been brought into this study because of the personal and group decisions and behavior involved in getting a complete response.

Questions to which the research study is directed include: What personal beliefs are involved in having an x-ray taken? What fears, information, and other attitude factors are important? How effective are various appeals, and why? What differences are found among different social and economic groups? How important is it that the person belong to a group actively involved in the project? How essential is personal contact in getting people to unite? Is it better that this contact be by someone previously known to the individual? What is the influence of weather and the location of x-ray units?

The tuberculosis project was planned in the hope that with the new antituberculosis drugs a more intensive effort at present would give much greater than the previous dividends in results. In addition it was felt that a careful evaluation and appraisal of this type of community project could apply to other public health programs involving active participation of entire population groups in selected communities.

Harvard Latin American Scholarships

Under a scholarship program sponsored by the United Fruit Company at the Harvard School of Public Health, graduate training in preventive medicine and public health is offered physicians from Costa Rica, Guatemala, Honduras, and Panama. The scholarships include tuition and also maintenance and travel expenses, depending on individual needs. The sponsor envisaged the purpose of the program to "assist in the improvement of health conditions in the Middle Americas by providing for the training of professional persons in the sciences of preventive medicine and public health."

Two scholarships are being offered for 1956, the first year of the program. Selection of candidates, made solely by the School of Public Health, will be based on prior academic records, experience, and demonstrated interest, plus the promise of future contributions in the field of public health of particular benefit to Central America. The final date for receiving completed admission and scholarship applications is January 1, 1956. Awards will be announced in March, 1956. Further information from the Secretary, Harvard School of Public Health, 55 Shattuck St., Boston 15, Mass.

Dual Inspection Held Unnecessary

The Court of Civil Appeals of Texas recently held unconstitutional the portion of a municipal milk ordinance requiring the city health officer of Laredo not to accept inspections, examinations, or certification by the health officer of another city in issuing permits to sell milk. Although the Texas legislature has adopted as a state-wide statute the Milk Ordinance and Code–1953 Recommendations of the Public Health Service, the city of Laredo contended that under its local ordinance it had the right and duty to inspect dairies at Falfurrias, 90 miles away, before issuing a permit. In Falfurrias Creamery Company vs. City of Laredo, (276 SW 2d 351 Tex. 1955) the court found that Falfurrias maintains a milk inspection service approved and accredited by the state authorities and that the Falfurrias Dairy had been duly inspected and passed. In recording its decision the

court observed that the intent of the legislature in enacting the state standard milk ordinance was to insure purity of milk sold in the state, provide for the free flow of wholesome milk from one city to another, and restrict erection of trade barriers that would result from pyramiding of inspection fees and services.

A New District in Pennsylvania

The Pennsylvania State Health Department has organized Northumberland, Snyder, and Union Counties into a health district staffed by a full-time medical director. The three counties, with a total population of about 170,000 had previously each been served by a part-time health officer. It is the hope of the department that the district may become a locally autonomous tri-county health department.

The director of the new district is L. D. Williams, M.D., M.P.H., with 10 years each in private practice and service in the U. S. Navy. He accepted this new assignment after completing work for the M.P.H. degree at the Pittsburgh Graduate School of Public Health.

Training Blue Cross Executives

The fourth annual Blue Cross-Blue Shield National Executive Training Program was held at the University of Michigan School of Business Administration during July and August. Among the faculty were S. J. Axelrod, M.D., professor of public health, School of Public Health, University of Michigan; James Hamilton, director of the program in hospital administration, University of Minnesota; C. Rufus Rorem, Ph.D., executive director, Hospital Council of Philadelphia; and Milton Terris, M.D., assistant dean for postgraduate education, School of Medicine, University of Buffalo.

Medical Research Accomplishments

What was accomplished in 1954 through the approximately $50,000,000 appropriated annually to the National Institutes of Health for research and training has recently been summarized in a special 50-page bulletin of the Social Legislation Information Bulletin. Titled, "Medical Research Accomplishments," this bulletin outlines the variety of research carried out in the fields represented by the seven specialized institutes that make up the National Institutes. It points out that two-thirds of the funds were used in the form of grants-in-aid to nonfederal research institutions.

Social Legislation Information Service, 1346 Connecticut Ave., Washington 6, D. C. $1. Reduction on quantity orders.

PERSONALS

WILLIAM C. BALLARD, M.D., is the new director, Pinellas County Health Department, St. Petersburg, Fla.

HERBERT B. BARKEN, M.D., formerly assigned to the St. Louis Venereal Disease Clinic, has recently been assigned by the Public Health Service to the West Virginia State Department of Health, Charleston, as medical consultant in venereal disease control.

ROBERT H. BISHOP, JR., M.D.,† director, the Joint Committee for the Advancement of Medical Education and Research, Western Reserve University School of Medicine and Affiliated Hospitals, Cleveland, Ohio, was recently awarded the American Social Hygiene Association's highest honor, the William Freeman Snow Medal for distinguished service to humanity.

WALTER M. BOWMAN, principal bacteriologist, West Virginia State Hygienic Laboratory, has resigned to accept a position with the Georgia State Department of Health, Atlanta.

SCOTT W. BRANDON, formerly with Metropolitan Engineers, Inc., Salt Lake City, and

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* Fellow.
† Member.

now a commissioned reserve officer of the Public Health Service, is chief sanitary engineer, U. S. Operations to El Salvador.

JEROME K. BRASCH,† formerly with the Portland Cement Association, has been appointed research assistant, Institute of Industrial Health, and resident lecturer, School of Public Health, University of Michigan, Ann Arbor, upon completion of graduate work at Harvard University under a U. S. Atomic Energy Commission Fellowship in Industrial Hygiene.

ROBERT BREWER, district sanitary engineer, California State Health Department, San Bernardino, since 1950, and a member of the Commissioned Engineer Reserve, Public Health Service, is now principal sanitary engineering adviser to the director of health, as a member of the U. S. Operations Mission to Surinam.

AMY CAWLEY, R.N.,† former assistant supervisor, Outpatient Department, Kansas Medical Center, and former industrial nurse, Transworld Airlines, Kansas City, has been appointed public health nurse for State Health District No. 5 of 16 counties, with headquarters in Salina, Kans.

MERTON N. CHALEF has been appointed senior agency consultant, Hospital Section, New York City Community Mental Board.

EDWARD M. COHART, M.D., M.P.H.,* associate professor of public health, Yale University Department of Public Health, has received a year's leave of absence to accept appointment as a deputy commissioner of health, New York City Department of Health.

MAJOR GILBERT H. COLLINGS, JR.,* formerly chief, Occupational Health Branch, Tennessee Valley Authority, has been assigned as deputy chief of the Army Environmental Health Laboratory and chief of its Occupational Health Division, Edgewood, Md.

BELLE CRICHTON, M.P.H.,† former health educator, San Antonio Health Department, is now health educator, Bexar County Tuberculosis Association, San Antonio, Tex.

MARY DENARO, M.P.H.,† health educator, Massachusetts Division, American Cancer Society, has been made a research associate, Harvard School of Public Health, to coordinate a program of health education in industries in cooperation with the Cambridge Community Services.

NORMAN DENOSAQUO, M.D.,† former medical officer, U. S. Food and Drug Administration, has resigned to become secretary, Committee on Research of the Council on Pharmacy and Chemistry, American Medical Association, Chicago, Ill.

HARRY K. DILLARD, M.D.,† former regional medical director, Division of Local Health Services, Kentucky State Health Department, has resigned to become health officer, of the Lexington-Fayette Health Department. He has been succeeded by SAMUEL S. SHOUSE, M.D.,† former assistant director, of the Norfolk (Va.) Health Department.

MARGARET DRENNAN,† former health educator, Cambridge Department of Public Health, has been appointed assistant director of health education, Massachusetts Tuberculosis and Health League.

ALLEN DYER, M.D., former director, Pike County Health District, Waverly, Ohio, is now director, Monongalia County Health Department, Morgantown, W. Va.

MARGARET M. EARLY, formerly a psychiatric social work supervisor, Adult Guidance Clinic, Brooklyn Catholic Charities, has been appointed field consultant for outpatient services, New York City Community Mental Health Board.

PERU FARVER, a Choctaw Indian and veteran of 45 years' service with the Department of Interior's Bureau of Indian Affairs, has been appointed to the staff of the newly organized Division of Indian Health, the Public Health Service, to serve as adviser to the Service on relations with the Indian and Alaskan native populations and their tribal councils.

EUGENE A. GILLIS, M.D.,* recently returned from a three-year detail with the Foreign Operations Administration in Beirut, Lebanon, is now regional medical director, Region III, Public Health Service, Washington, D. C., succeeding A. B. PRICE, M.D., who has been transferred to the Bureau of Old Age and Survivors' Insurance.

BENJAMIN C. GRUENBERG, Ph.D., and SIDONIE MATSNER GRUENBERG recently received a joint Honorary Life Membership of the American Social Hygiene Association "in recognition of their great contributions to the cause of family life education in America."

WILTON L. HALVERSON, M.D., Dr.P.H.,* professor of public health, University of California at Los Angeles School of Public Health, has been appointed by President Eisenhower a member of the International Development Advisory Board for a two-year term to advise on the technical assistance program.

GASTON HERD, former administrator, Hardin Memorial Hospital, is now consultant on

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* Fellow.
† Member.

hospital management, Division of Hospital Services, Kentucky State Health Department, Louisville.

MILTON TAYLOR HILL,† former senior sanitary engineer, Middletown District Office, has been appointed assistant director, Office of Professional Training, New York State Health Department, Albany.

N. PAUL HUDSON, M.D.,* dean, Graduate School, Ohio State University, Columbus, has resigned in order to return to the Department of Bacteriology where he holds the title of research professor.

JOSEPH E. JOHNSTON has been appointed state sanitary engineer, Mississippi Health Department, succeeding the late HERBERT KROEZE.*

G. R. JONES, M.D.,* former director, Division of Preventive Medicine, Kentucky State Health Department, returned from two years' military duty, and is now in charge of the department's school health program.

BRIGADIER GENERAL WILLIAM J. KENNARD,† MC, USAF (Rtd.), has joined the Washington office staff of the American Medical Association as an assistant director.

MARION KRIEBELL, former director of casework, Catholic Charities Guidance Institute, Archdiocese of New York, has been appointed senior field consultant, New York City Community Mental Health Board.

MADELEINE LAY, formerly associate professor, Adelphi College School of Social Work, has been appointed chief senior field consultant, New York City Community Mental Health Board.

FRANCES MCFEELY is the first professionally trained social worker in the Imperial County (Calif.) Health Department, a position made possible through a grant from the Rosenberg Foundation.

RUTH M. MARTIN, R.N., recently returned from studying at the Institute of Education and School of Hygiene and Tropical Medicine, University of London, has been appointed assistant executive secretary for the International Unit, American Nurses' Association, New York City, succeeding JEANNE LAMOTTE, R.N., resigned to become nurse officer, Fellowships Branch, Pan American Sanitary Bureau.

HARRY S. MUSTARD, M.D.,* executive director, New York State Charities Aid Association, New York City, has retired and his future address is Boykin, S. C.

CHARLES D. NEWTON and WENDELL PHILLIPS, sanitary engineers, have joined the staff of the Oklahoma State Department of Health, Oklahoma City.

BENJAMIN PASAMANICK, M.D.,† formerly associate professor, Division of Mental Hygiene, Johns Hopkins School of Hygiene, has been appointed professor of psychiatry, Ohio State University College of Medicine, Columbus, and director of research, Columbus State Psychiatric Institute.

FREDERICK S. PHILIPS, Ph.D., former head of the Department of Pharmacology, Division of Experimental Chemotherapy, Sloan-Kettering Institute for Cancer Research, is now research consultant, American Cancer Society, New York City.

ROBERT E. PLUNKETT, M.D.,† has received the Charles Evans Hughes Award from the Capital District (Albany) Chapter, American Society for Public Administration, for his work in the control and eradication of TB during the 30 years he has served in the State Health Department's TB Control Division, currently as chief officer.

PERRY F. PRATHER, M.D.,* now deputy director of health, has been appointed by the Maryland State Board of Health, Baltimore, and by the governor as director of health for Maryland, to succeed ROBERT H. RILEY, M.D., Dr.P.H.,* who will retire December 31, 1955.

HOWARD R. PYLE, sanitarian, Cabell-Huntington (W.Va.) Health Department, is at University of North Carolina School of Public Health, Chapel Hill, studying for a master's degree in public health.

LINVIL G. RICH, Ph.D., a member of the Commissioned Reserve, Public Health Service, and faculty member, Virginia Polytechnic Institute, has been called to active duty and assigned to the U. S. Operations Mission to La Pas, Bolivia.

MARY ROMER, R.N., M.P.H.,† is nursing consultant in epidemiology to the Division of Public Health Nursing, Kentucky State Health Department, Louisville, on special assignment from the Public Health Service Communicable Disease Center.

BERNARD F. ROSENBLUM, M.D.,† Public Health Service officer, formerly assigned to the VD Program, Leon County (Fla.) Health Unit, is now director, Division of Communicable Disease Control, New Mexico Department of Public Health, Santa Fe.

HILDEGARD ROTHMUND, M.D., Dr.P.H.,† who received a doctorate in public health at the Johns Hopkins University School of Hygiene and Public Health, in June, is now associate in preventive medicine, Woman's Medical College of Pennsylvania, Philadelphia.

JOHN A. RUDD,† who has completed a demon-

* Fellow.
† Member.

stration as regional director, Texas Heart Association, is now director of public relations, Hospital Authority of the City of Lynchburg, Va.

CHARLES W. SHILLING, M.D., former head, Department of Hygiene, U. S. Naval Academy, has been appointed special assistant to director of the Atomic Energy Commission's Division of Biology and Medicine, Washington, D. C.

HELEN SPEYER, former director of international service, National Association for Mental Health, has been appointed senior agency consultant, Division of Research and Planning, New York City Community Mental Health Board.

LEON STERNFELD, M.D.,† former chief of preventive medicine, Fort Devens, with the rank of major in the Medical Corps, is now health commissioner of Cambridge, Mass.

FREDERICK L. STONE, Ph.D., assistant for professional services to the vice-chancellor, School of the Health Professions, University of Pittsburgh, has been appointed director of the Medical and Scientific Department, National Multiple Sclerosis Society, New York City.

JANE B. TAYLOR, R.N., M.P.H.,† former director of nurses, Topeka-Shawnee County (Kans.) Health Department, is now director, Combined Nursing Service, Minneapolis (Minn.) Health Department and Visiting Nurse Service.

JOHN E. TRYGG, M.P.H.,† of the Louisiana State Department of Health, has been appointed state sanitary engineer, succeeding JOHN O'NEILL, retired.

GEORGE WILSON, associate director, Bureau of Industrial Hygiene, West Virginia State Health Department, Charleston, has resigned to enter private industry.

NETTA W. WILSON,* former health education consultant and editor of "Minnesota's Health," is now health education consultant, Portland (Ore.) Area Office of the U. S. Bureau of Indian Affairs.

DEATHS

CHARLES PORTER BOTSFORD, M.D.,* superintendent of health of the City of Hartford, Conn., from 1899 to 1935, on September 6 at the age of 84 (Health Officers Section).

JOHN MILTON COOK, SR.,† chief sanitarian, Little Rock, Ark., on April 12 (Engineering Section).

CHARLES A. EMERSON,* consulting engineer, Havens and Emerson, New York, N. Y., on August 24 (Engineering Section).

H. A. KROEZE, C.E.,* director, Division of Sanitary Engineering, Mississippi State Board of Health, Jackson (Engineering Section).

SHERMAN D. MEECH,* managing director, Rochester Hospital Service Corp., Rochester, N. Y. (Public Health Education Section).

FRANCIS J. SETTE,* formerly special assistant to director, Bureau of Reconversion Priorities, Civilian Production Administration, Washington, D. C., on July 20 (Engineering Section).

MORRIS S. SIEGEL, LL.B., J.D.,* executive assistant to health officer, City Health Department, Los Angeles, Calif. (Engineering Section).

ROBERT A. STRONG, M.D.,† of W. F. Prior Company, Inc., Hagerstown, Md. (Maternal and Child Health Section).

JAMES A. SUMMERS, M.D.,† county health officer, Pulaski County, Little Rock, Ark., on July 7 (Health Officers Section).

DR. ANDREW TOPPING,* School of Hygiene, London, England. Dr. Topping was an Honorary Fellow of the Association.

HARRY WEISS, M.D.,† of New York, N. Y. (Epidemiology Section).

CONFERENCES AND DATES

American Public Health Association, 83rd Annual Meeting, Kansas City, Mo., November 14–18.

State and Regional Public Health Meetings:

Oklahoma Public Health Association. Student Union—A & M College. Stillwater, Okla. November 7–9.

Tennessee Public Health Association. Maxwell House Hotel, Nashville, Tenn. November 30–December 2.

Meetings of Other Organizations Coming in November, December, 1955, and January, 1956:

American Medical Association. Clinical Meeting. Boston, Mass. November 19–December 2.

American Public Welfare Association. Hotel Statler, Washington, D. C. November 30–December 3.

* Fellow.
† Member.

American Society of Tropical Medicine and Hygiene. Somerset Hotel, Boston, Mass. November 2–5.

Association of State and Territorial Health Officers. Washington, D. C. November 6–12.

Conference on Rheumatic Fever and Rheumatic Heart Disease. Hotel Biltmore, New York, N. Y. November 29.

Council of National Organizations of the Adult Education Association of the U.S.A. Atlantic City, N. J. December 12–13.

National Association for Mental Health. Indianapolis, Ind. November 4–6.

National Social Welfare Assembly. New York, N. Y. December 8–9.

National Society for Crippled Children and Adults. Palmer House, Chicago, Ill. November 28–30.

Pan American Congress of Ophthalmology (Fifth). Santiago, Chile. January 9–14, 1956.

United Cerebral Palsy. Washington, D. C. November 19–21.

White House Conference on Education. Washington, D. C. November 28–December 1.

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Association for the Aid of Crippled Children, New York, N. Y.
George Baehr, M.D., New York, N. Y.
Borden Company, New York, N. Y.
Chlorine Institute, Inc., New York, N. Y.
Congress of Industrial Organizations, Washington, D. C.
Difco Laboratories, Detroit, Mich.
Diversey Corporation, Chicago, Ill.
Equitable Life Assurance Society of the United States, New York, N. Y.
Grand Concourse Medical Group, New York, N. Y.
John Hancock Mutual Life Insurance Company, Boston, Mass.
Hellige, Inc., Garden City, N. Y.
Hoffmann-La Roche, Inc., Nutley, N. J.
International Association of Ice Cream Manufacturers, Washington, D. C.
International Association of Machinists, Washington, D. C.
International Equipment Company, Boston, Mass.
Lederle Laboratories Division, American Cyanamid Co., New York, N. Y.
Liberty Mutual Insurance Companies, Boston, Mass.
Licensed Beverage Industries, Inc., New York, N. Y.
Life Insurance Company of Virginia, Richmond, Va.
Lily-Tulip Cup Corporation, New York, N. Y.
Merck & Company, Inc., Rahway, N. J.
M & R Laboratories, Columbus, Ohio
Metropolitan Life Insurance Company, New York, N. Y.
Montefiore Hospital Medical Group, New York, N. Y.
National Dairy Products Corporation, New York, N. Y.
New York Hotel Trades Council and Hotel Association Health Center, Inc., New York, N. Y.
Oval Wood Dish Corp., Tupper Lake, N. Y.
Prudential Insurance Company of America, Newark, N. J.
Rip Van Winkle Clinic, Hudson, N. Y.
Ross-Loos Medical Group, Los Angeles, Calif.
Sealright Company, Inc., Fulton, N. Y.
Sharp and Dohme, Inc., Glenolden, Pa.
Sidney Hillman Health Center, New York, N. Y.
E. R. Squibb and Sons, New York, N. Y.
Steiner Sales Company, Chicago, Ill.
Sun Life Insurance Company, Baltimore, Md.
Theatre, and Amusement Building Janitors' Union, Chicago Office, Chicago, Ill.
Travelers Insurance Company, Hartford, Conn.
UAW-CIO (United Automobile, Aircraft and Agricultural Implement Workers of America), Detroit, Mich.
Union Central Life Insurance Company, Cincinnati, Ohio
Upjohn Company, Kalamazoo, Mich.
Velsicol Corporation, Chicago, Ill.
Winthrop-Stearns, Inc., New York, N. Y.
Wyeth Laboratories, Inc., Philadelphia, Pa.

10th EDITION OF DAIRY PRODUCTS

The *10th Edition of Standard Methods for the Examination of Dairy Products* is now available. This half-century old authority in the laboratory examination of milk, cream, and frozen dairy food ingredients has been completely rewritten. Important changes will be found in:

Emphasis on direct microscopic clump counts.

Methods of sampling milk and cream.

Determination of time lag in obtaining uniform temperature in all milk or cream in various sizes and shapes of tanks.

Substitution of swab method for determining surface contamination of equipment.

Emphasis on use of 3-A Sanitary Standards for equipment.

Use of milk-free plating medium.

Approval of a metal syringe measuring 0.01 ml test portions of milk or cream.

Stains approved for direct plate counts.

Interpretations of coliform counts.

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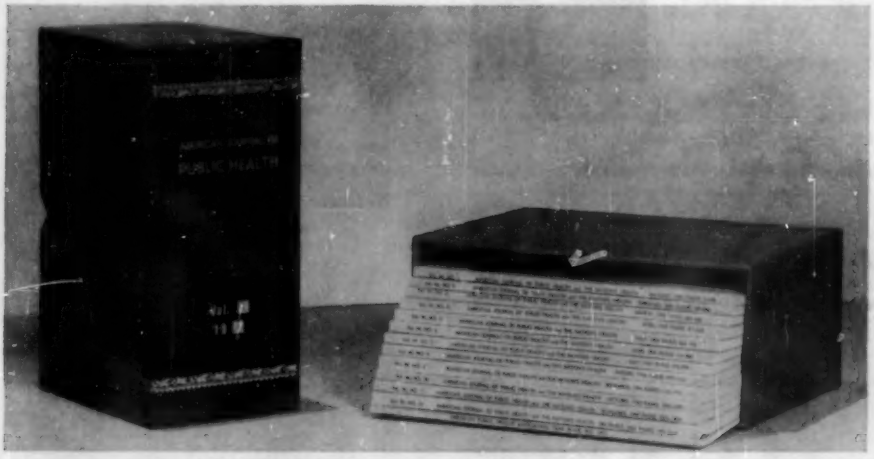

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